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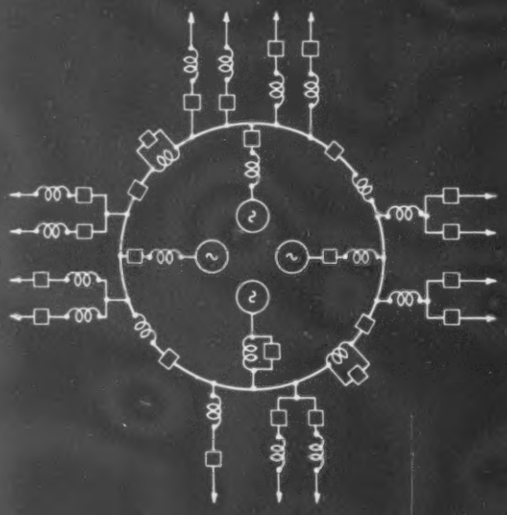

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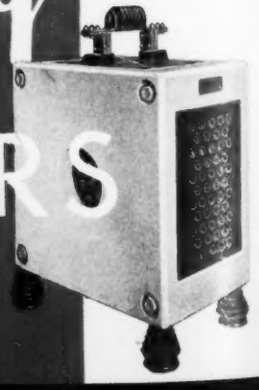

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Prepared

With the outbreak of hostilities in Europe one naturally wonders how well the United States is prepared for war. If the Army, the Navy, and the entire munitions-producing industry were as well equipped right now as is the electric utility industry the country could in less than 24 hours be operating at the peak of war activities. The electric power industry is prepared.

In fact, it is better prepared for power supply than is any other nation. In 1937, the last year for which figures are available, Great Britain had 180 kw. per thousand of population, Germany 200 kw. (before Munich), France 250 kw. and the United States 286 kw. In 1917 we had but 114 kw. Since 1937 nearly another 25 kw. has been added, bringing the total up to 311 kw. per thousand people, or nearly three times that available at the time of the last war.

War, however, does not raise peaks in proportion to munitions production. Munitions largely supplant peace-time production in peace-time factories. And if these factories have been working at top speed for at least one shift, then munitions production, while increasing the kilowatt hours, is not going to increase the peak materially.

Data for the World War showed that while peaks did increase during 1915 and 1916, there was not nearly so great an increase in 1917 and 1918. On the other hand, the 1919 peace-time peaks were much greater. The data also showed that load factors increased during the war, but fell off tremendously in 1919. The combined peaks of twelve companies that served a major portion of the war load increased from 1916 through 1918 but 18 per cent.

Even so, the generating capacity in the principal munitions area, exclusive of that installed this year or now on order, is nearly 50 per cent greater than the greatest demand ever placed upon it. And since under busy times the industrial consumption is less than 50 per cent of the total output, it is obvious that there is sufficient capacity to take care of an industrial peak twice as large as ever before. Such a situation could not possibly occur for a long time after munitions production started, if ever, due to limitation of skilled labor and productive area.

Last year's figure for the 37 largest producing utilities in the munitions area east of the Mississippi show a reserve capacity above cumulative peaks of 46 per cent. The actual reserve, taking into consideration interconnections and peak diversity, is considerably greater.

An analysis of cities where there was the greatest difficulty in 1917 and 1918 with power supply will probably show the development of new war industries, such as shipping. And even in those cities by 1919 the peace peak was greater than the war peak and was being served with no great difficulty.

No, the facts show that the electric utility industry is better prepared right now than any arm of the government or industry to handle any emergency that war might bring.

Congress and the country can go ahead with other war preparedness plans with full assurance that the vital power supply has been taken care of and will not be a source of embarrassment to those responsible for munitions production.

The electric power industry is prepared!

CAPACITORS RELEASE

R. E. PAXSON, *Engineer Michigan Gas & Electric Company, Holland*

MERRITT LAWRENCE, *General Electric Company, Grand Rapids*

BY SPENDING $12,700 to install 1,550 kva. of capacitors the following major benefits resulted on the system of the Michigan Gas & Electric Company:

1. Reduction of 1,000 kva. in average purchased power monthly billing demands.

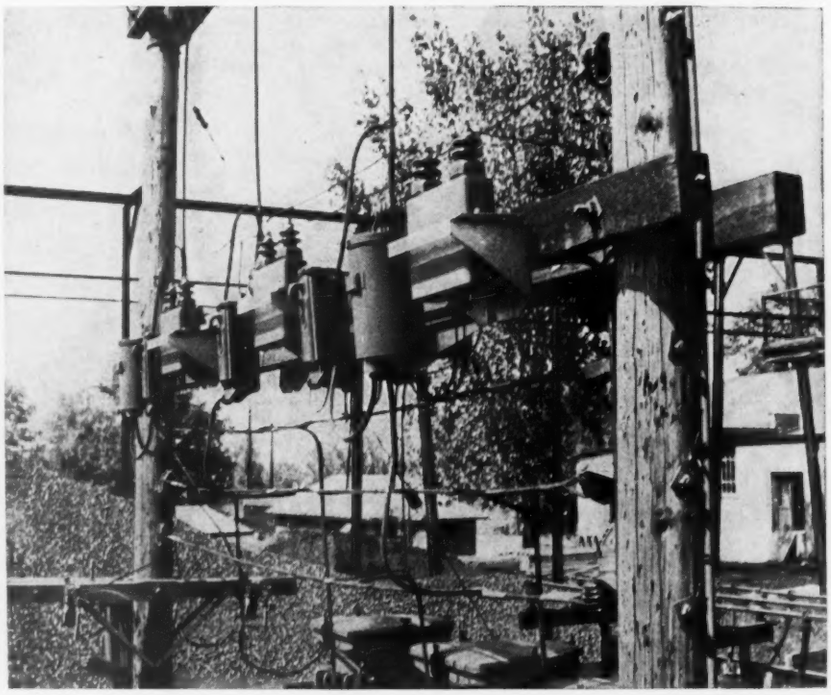
2. Improved system power factor, resulting in an average purchased energy power-factor improvement of 85 to 99 per cent. This earns purchased power billing credit of 4.5 per cent, or $3,600 annually, showing a 28.3 per cent return on the over-all investment.

3. Decreased hydro-generator excitation, which allows greater station output to the system and reduces maintenance on generator and exciter circuits; 25 per cent less energy is used for generator excitation than before capacitors were installed.

4. An additional 800,000 to 1,000,000 kw.-hr. yearly output from water formerly wasted in condenser operation of generators.

5. Overloads and low-voltage conditions on several distribution feeders relieved, allowing postponement of larger investments in line rebuilds.

6. Made available from 10 to 30 per cent more kw. capacity in each substation on the system without additional investment in larger transformers.



Substation Loads Reduced

One substation which was carrying 10 per cent transformer overload during 1937 peak periods operated a year later at 10 per cent under the transformer ratings while carrying an actual 3 per cent increase in kw. load. Average power factor on this substation was corrected from 73 per cent lagging to 100 per cent.

Three other substations which were operating above the kva. ratings of the transformer banks are now carrying peak kw. loads from 7 to 25 per cent higher than before, with actual decrease in kva. loading on the transformers. Some of these substations will continue to have capacity for the next two years' load increases, due entirely to power factor improvements ranging from 65 and 75 up to 95 and 98 per cent.

7. Gained 700 kw. additional hydro plant peaking capacity due to availability of all generators for power generation instead of using them as synchronous condensers. This adds 44 per cent to the former hydro plant capacity available during system peak loads.

8. Postponed the installation of step-voltage boosters on one three-phase, 6.9-kv. rural and resort feeder at least one year. This investment would amount to $1,800, carrying charges on which, at 12 per cent, show a saving of $216 per year.

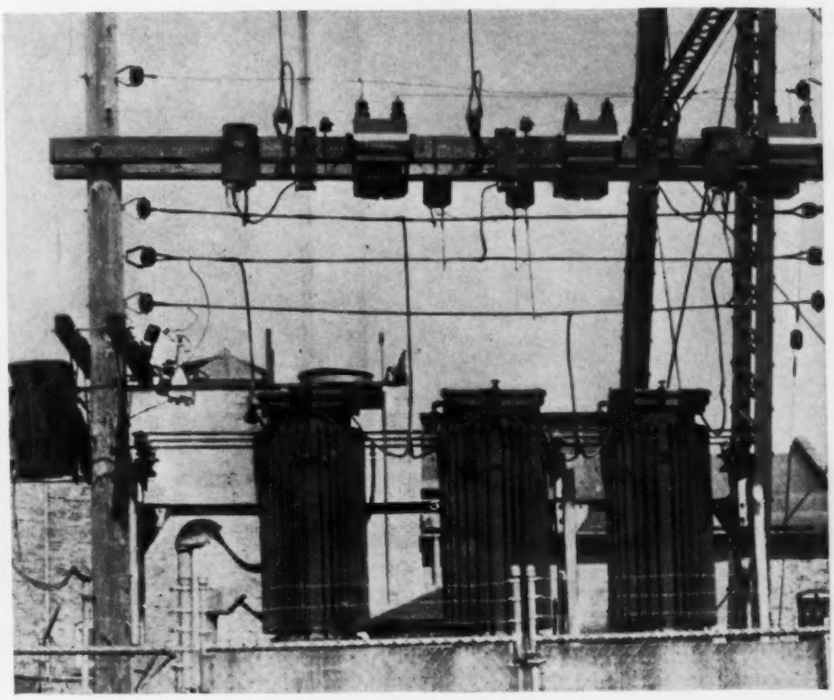
Although the above eight benefits derived from the application of capacitors do not comprise a complete summary, they do, however, indicate to some extent the improved conditions now enjoyed, as compared to former operation. While some of the items listed have not been evaluated in terms of annual savings, we believe sufficient indication has been made to permit an understanding of their importance.

Complete data have not at this time been compiled on all phases of the improvement, but results prove increasingly that the $12,700 investment is amply justified on the basis of benefits returned.

The Michigan Gas & Electric Company, southern division, operates a transmission and distribution system serving a peak load of 4,000 to 5,200 kw. In addition to three hydro plants having a combined maximum generating capacity of approximately 2,600 kw., power is purchased for remaining system requirements from a neighboring utility. This purchased power feeds into the 25-kv. transmis-

HYDRO, RAISE VOLTAGE

Decreased purchased-power bill pays return on corrective investment — Station maintenance on less-excited generators lowered — Water waste by hydro-driven condensers averted — Distribution investments postponed — Substation capabilities enhanced by reducing transformer loadings



sion system at two points of interconnection.

Billing for purchased power is based upon a coincident kva. demand basis, with credits allowed for average monthly power factor above and penalties charged for average power factor below 85 per cent. Minimum monthly bills, as well as the initial block of the power rate, are computed on the basis of 250 hours use of the maximum kva. demand per month.

From the above outline of system and purchased power conditions it may readily be understood that low power factor at the purchased power interconnections might easily cost a substantial sum of money, since a 2,000 kw. demand occurring at a power factor of 80 per cent, for example, would create a billing demand of 2,500 kva., thereby adding 500 × 250 or 125,000 kw.-hr. to the monthly minimum bill over and above the cost of the same kw. demand if made at unity power factor. During periods of high water the hydro plants carry a large proportion of daily system load except through system peak hours. At such seasons of the year monthly purchased power cost is usually limited to the minimum bill as determined by 250 hours use of the maximum kva. demand. The problem, therefore, of maintaining, or attempting to maintain, a reasonably high power factor of purchased energy, especially during high water seasons, is an important one from a power production and cost standpoint.

Inability to boost voltage sufficiently high at the hydro plants to provide for reactive voltage drop to the points of interconnection and to the more distant system loads has necessitated calling upon the purchased power source to supply a large amount of reactive component. This has resulted in low average power factors (as low as 61 per cent) because the kilowatt-hour requirements at such times have been low, while reactive kva.-hours remained high, with consequent costly purchased power.

During the summer of 1937 a system study was made in order to find an economical solution to the power-factor problem. A number of other unfavorable conditions were revealed as a result of the study. For example, it was found that in order to maintain reasonable transmission voltages during system peak hours from one to five hydro generators were being operated as synchronous condensers, using water at 0.25 to 0.3 gate opening with little or no energy output to the system. This resulted in a large waste of hydro power, because the use of hydro turbines as synchronous condensers was an expensive method of obtaining voltage and power factor improvement. Stream flow was ineffectively utilized, since a condition frequently existed in which the hydro plants were producing more energy during off-peak hours than they were generating during periods of greater system need. Naturally, this tended to increase purchased power kva. demands and added to the over-all cost of purchased power. Furthermore, the voltage rise and power-factor improvements obtainable by means of using generators as synchronous condensers were of no benefit in reducing the reactive current component on distribution feeders and on a large portion of the transmission circuit beyond purchase interconnections.

Average power factor at the distribution substations ranged between 63 and 80 per cent, with consequent need for oversize transformers.

Solution

As a result of the system study it was determined that while there were other possible solutions to the initial problem of purchased-power power-

[*Continued on page 14*]

Economical Line Construction Methods and Equipment

Adequate and well-chosen equipment rounds out program of careful engineering design coupled with well-trained and suitably equipped crews

J. R. NORTH, *Assistant Electrical Engineer Commonwealth & Southern Corporation, Jackson, Mich.*

ECONOMICAL construction of distribution lines in rural and suburban areas requires not only adequate engineering design but also effective construction methods and equipment, with crews of properly trained men, well organized and suitably equipped.

This type of work may, in general, be divided into two classifications or groups:

(a) *Ground Work*—Surveying and clearing, distributing construction materials, digging holes and setting poles, guying, installing grounds.

(b) *Line Work*—Stringing wire, mounting transformers and protective equipment, running services and connecting meters, energizing line.

The "line work" need not always be done at the same time nor immediately following the "ground work." In many cases it is more economical to schedule the construction program, if the project involves a mile or more, so that all the "ground work" is performed by one or more crews of ground men, with the "line work" being performed whenever desired by line crews. This co-ordinated method of procedure and equipment was developed and has been followed now for several years by a progressive group of operating companies, resulting in very substantial savings in line construction costs. This procedure is as follows:

1. Poles are framed, dressed and bored before treatment or in the yard. Arms are fitted with pins and braces in the storeroom.

2. Pole line material, including poles, arms, pins, insulators, braces, anchors, etc., are hauled out to the job and distributed near each pole location by a crew of three to five men, using a 1½-ton stake body truck and trailer. The digger truck may also haul a trailer load of poles out to the job, but the distribution of these poles is made by the material truck crew.

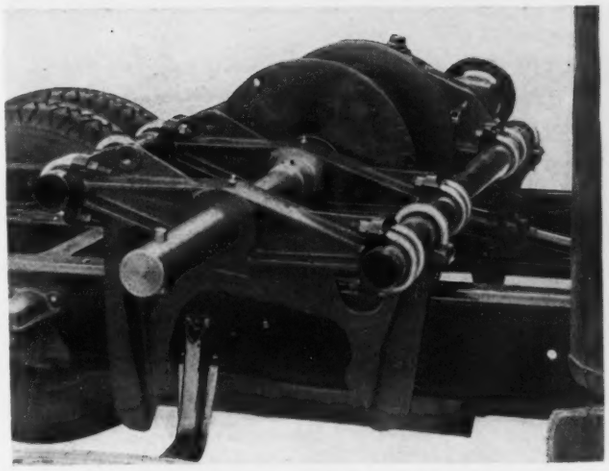
3. The poles are carried singly or in pairs from the roadside back to the line location (assuming the line is built on private right-of-way well back of the fence line) by the digger truck, which is also equipped with a derrick and winch. The pole and anchor holes are dug by the earth-boring machine, the pole dropped in and the digger truck then proceeds to the next location to repeat the operation.

4. The material truck crew, having distributed the load of material, now backfills, straightens and tamps the poles, following the same route as the digger and crew. In some cases, depending upon the length of line under construction, the poles may be tamped in by a ground crew accompanying the digger.

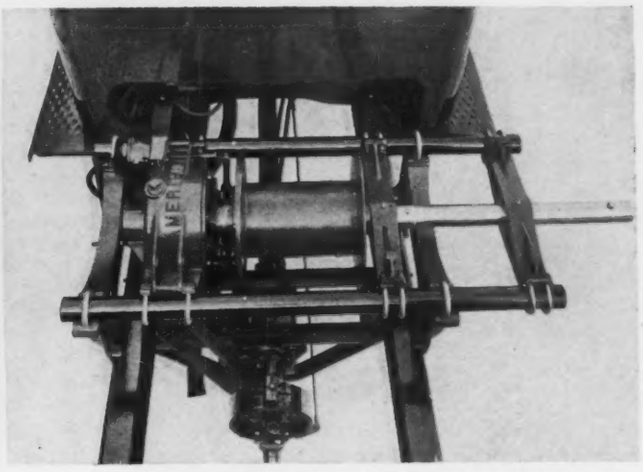
5. Subsequently, the line crew with a regular line truck equipped with winch and derrick, etc., proceeds to the job with the line conductors and other equipment. The line wires are

Rear view of digger truck showing lowering of pole in hole

Rear view of digger truck showing crew picking up pole from side of road with winch and derrick



New type low-mounted winch with free running drum. Note low, rugged mounting



Winch showing drum clutch and automatic brake

then pulled in and tied, guys installed, transformers hung, fuses, lightning arresters, etc., mounted. After connecting the services and meters and making an inspection, the line is energized and service begun.

For incidental short line extensions, involving only a few poles, it is often practicable to use only the digger truck for the entire job.

Automotive Equipment

The construction trucks and equipment must also be selected to fit these specific needs and usually include:

1½-ton truck with 12-ft. stake body.

Pole trailer.

Digger truck with earth-boring machine.

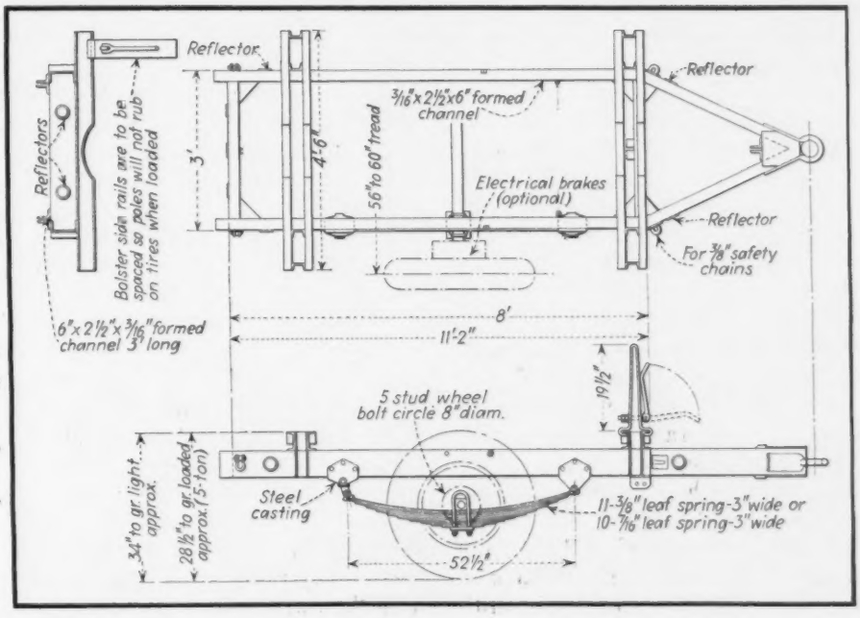
Wire reel trailer.

Light line truck.

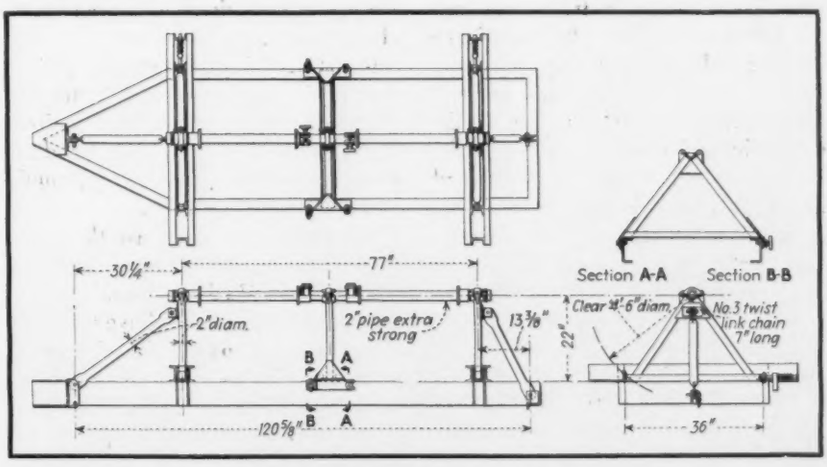
Service truck.

The material truck generally used is a 1½-ton truck having a gross vehicle weight rating (GVW) of approximately 10,000 lb. and equipped with a 12-ft. stake body and rear pintle hook.

The pole and wire reel trailers are balanced, light-weight, two-wheel trailers equipped with pneumatic tires and have a capacity of 10,000 lb. These trailers are easy to handle and can travel at the same speed as modern trucks. When carrying poles, double bolsters are used and the bottom center pole is equipped with a suitable drawbar to serve as a tongue. To carry two reels of wire the side upright members are removed and a reel rack is substituted.

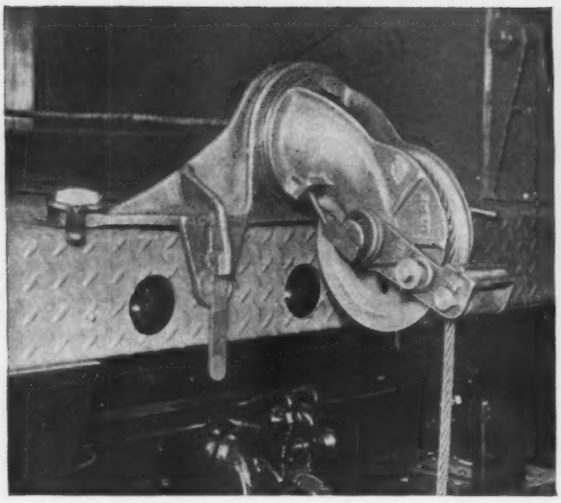


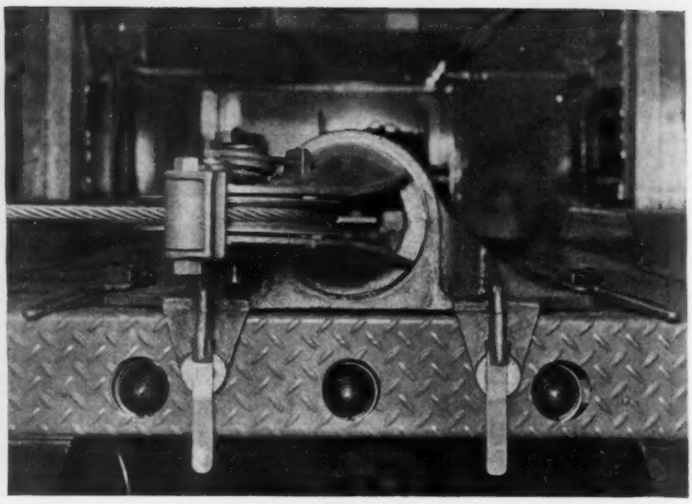
Two-wheel pole trailer



Wire reel rack for use with two-wheel trailer

Pole-hole digging and setting trucks are a very important adjunct to this method of line construction. They have proved to be very satisfactory not only for rural line construction but for the construction of wood pole transmission lines as well. A short wheelbase (132 in.), light-weight (GVW rating = 11,000 lb.) truck is generally to be preferred for this service, with high traction tires on all wheels, dual on the rear. These can negotiate almost any kind of surface, reaching practically any location where it may be desired to set





Left—Swivel sheave installed at rear of line truck—raising load out of manhole. Right—Swivel sheave used on side pull

a pole. Our two-wheel-drive units each has a total gross weight of only 7,500 lb. completely equipped and the four-wheel drive trucks completely equipped weigh only 8,500 lb. gross each. The truck chassis has an exceptionally sturdy frame (section modulus 5+) and rear axle assembly to withstand the very severe racking, twisting and poor traction encountered. The truck engine develops an abundance of power and is provided with a suitable lubricating and cooling system to perform satisfactorily over the wide range of intermittent duty imposed by digging work.

In areas where unusually severe tractive conditions are encountered, such as in very rough, hilly, mountainous country, more traction may be required than is provided by ordinary two-wheel drives. In these areas light four-wheel drive trucks are used for pole-hole digging. Our experience with earth-boring machines mounted on caterpillar type tractors was not particularly satisfactory due to the relatively high operating costs of the tractors and the inconvenience and lost time when moving such equipment from one location to another. The tractors were too slow for road travel and a truck and a four-wheel trailer were required for their transportation to and from the job.

Earth-Boring Machine

The earth-boring machine consists essentially of a power-operated gear train assembly driving an auger mounted on a 7-ft. rackbar which may be used at various angles. The truck engine is used to drive the machine, which is designed for use with various size augers up to and including 20 in. in diameter. However, in rocky soil or frozen ground, a 16-in. auger is usually the largest used. A hand-controlled clutch enables the operator to raise or lower, start or stop the auger at will. The actual digging of a hole 20 in. in diameter and 6 ft. deep requires only two to three minutes and the digger can readily dig and drop forty to fifty poles per day.

The boring machines are mounted on a steel-reinforced platform type body with the sills and framework adequately supported and rigidly fastened. It is important to have only a minimum distortion of the earth-boring machine and driving-gear mechanism. An overhead rack frame just behind the cab supports the pole horizontally when it is being carried from the road back to the line location. A small power-operated, worm-driven, winch drum, complete with clutch and automatic brake, is built integral with the boring machine. The derrick is also an integral part and the upper sheave pulley is 17 ft. from the ground. This permits handling poles up to 45 ft. or more in length.

Experience has shown that it is absolutely essential to have the earth-boring machines operated only by trained and skilled operators, and it is generally preferable to have the operator also responsible for the maintenance and repair of the machine. Detailed operating and maintenance instructions have been prepared, including routine weekly and monthly inspection schedules, maintenance and repair procedure and general operating instructions.

There are now twenty-seven of these trucks with earth-boring machine units operating in our various areas. Twenty-three units are on two-wheel-drive trucks and four are on four-wheel-drive trucks. These have each averaged over 3,500 pole and anchor holes per year, in addition to making emergency pole replacements, unloading poles, hauling poles, cutting through ice to reach manhole covers, raising transformers, etc. Experience of several years in territory where soil conditions range from sand and gravel to clay and loam indicates that, with these earth-boring machines, the net saving in digging holes and placing poles alone has amounted to well over $1 per hole.

Line Trucks

The line and service trucks used are the standard Commonwealth & Southern design and have been previously described—ELECTRICAL WORLD, March 28, 1936, page 892, and June 4, 1938, page 1862. Some of the auxiliary equipment has also been improved in conjunction with the manufacturer. More outstanding recent developments included a simplified and more rugged form of winch mounting with the center line of the drum low with relation to the top of the frame, keeping the winch line close to the body floor and placing the thrust almost in direct line with the frame. A vacuum-operated clutch and free running drum with brake are incorporated with the winch.

Another very convenient accessory is a full swivel sheave, shown in the accompanying illustrations, which is designed for mounting on the rear of the line construction truck-body. The tension keeps the winch line in proper position at all times, whether the line is run up, down or sideways.

High-Pressure Extension Adds to Base Load Capacity

Houston steam plant, with important substation, in industrial area near load center, changed from peak and "back-up" status and modernized by installation of condensing turbine and semi-outdoor boiler

LOUIS ELLIOTT, *Consulting Mechanical Engineer, Ebasco Services Inc., New York*

GABLE STREET generating station, in which no new turbine capacity has been installed for about 20 years, has now been extended and modernized through the addition of a 25,000-kw., 850-lb. condensing unit. The plant is near the heart of the Houston load, a substation on the same site serving the important network in the main business area. It is in an industrial district and, in general, strategically located. These considerations account for choice of this location, despite limitation of condensing water, for required additional firm capacity for Houston load.

Gable Street plant, in addition to incorporating the system's largest substation, has for about fifteen years served for peaking purposes and as "backup" for Deepwater station. In this latter plant, which is 8 miles below the city on Houston Ship Channel, the initial 40,000-kw. installation was made during 1923-24, with extension to 147,000 kw. by 1931, including a 1,250-lb. topping unit. For a number of years Deepwater met Houston's growing power requirements, backed by Gable Street with 30,000 kw. capacity (equivalent to an average unit at Deepwater), and the combination gave excellent service at moderate cost of generation.

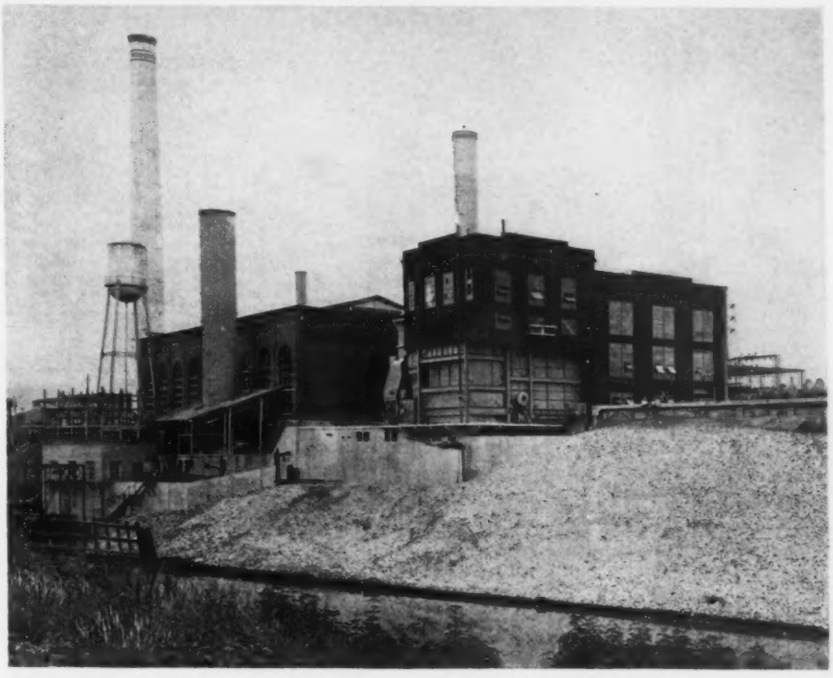


Fig. 1—Boiler equipment of semi-outdoor type. Canopy of asbestos-covered corrugated sheeting designed to come down over drum, supported by boiler columns. Exposed casing joints made weather-tight, minimizing corrosion. Structural expense reduced

Condensing Unit Chosen

The decision to put a 25,000-kw., 850-lb., 900-deg. F. condensing unit at Gable Street was based on careful study of no less than eight feasible plans. These included various combinations of condensing and superposed extensions to either or both stations, as well as the construction of a wholly new plant. The scheme chosen, beginning with a condensing unit at Gable Street, contemplated as a subsequent step a similar installa-

Fig. 2—Compact cooling tower provided with twelve forced-draft fans

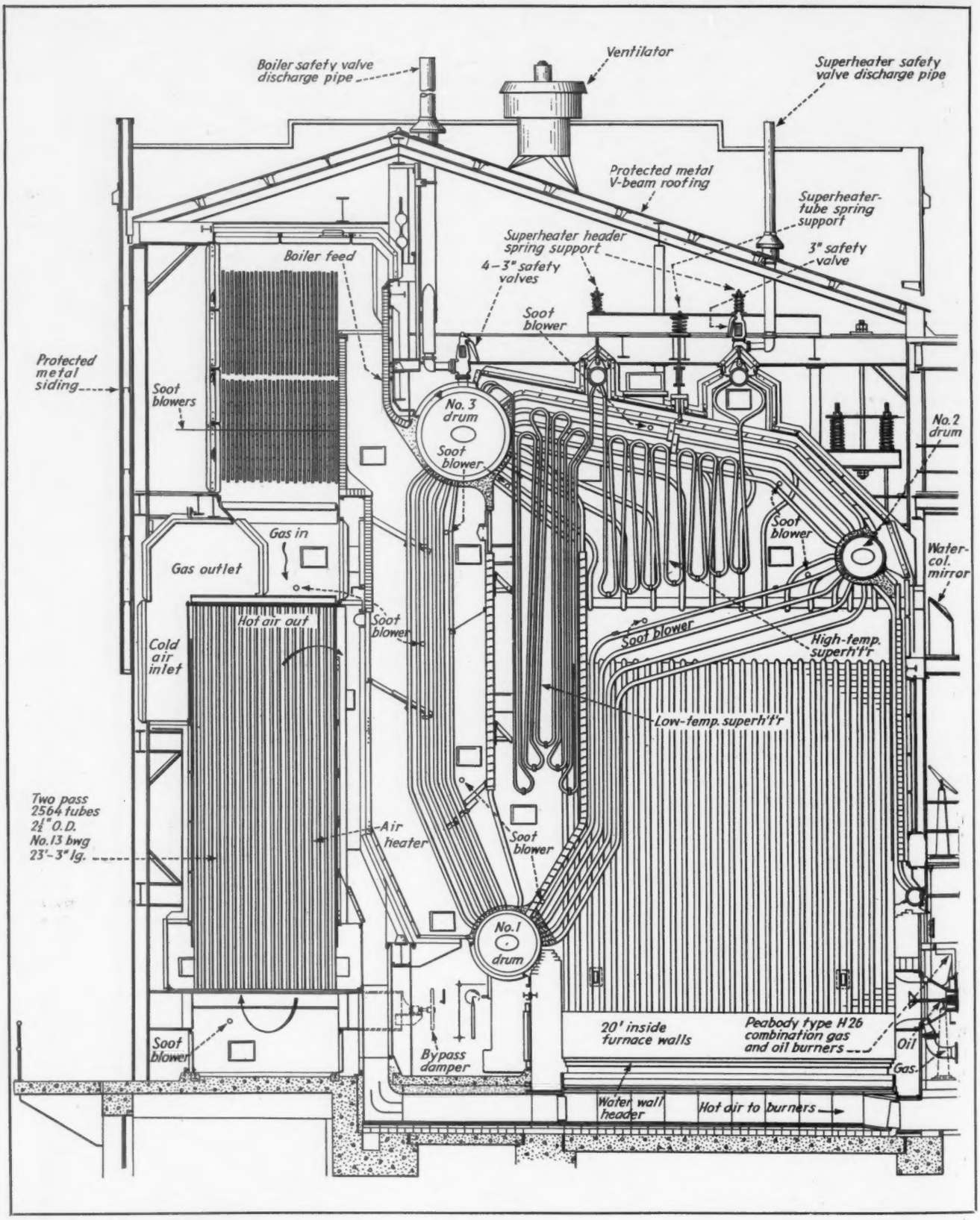


Fig. 3—Bent-tube three-drum unit burning natural gas with oil as reserve

Normal maximum steam generation 250,000 lb. per hour, normal superheater-outlet pressure 875 lb. gage (design pressure 927 lb.) and temperature 910 deg. F., with feed to economizer about 350 deg. F. Heating surfaces approximately as follows: boiler proper, 10,500 sq.ft.; superheater, 8,700; water walls, 1,700; continuous-loop economizer, 6,200; tubular air heater, 39,000 sq.ft. Unit heat release in furnace at full load between 34,000 and 35,000 B.t.u. per cu.ft. per hour. Air heater to heat air from 100 deg. F., to about 400 deg. F. Efficiency guarantee at 250,000-lb./hour. output, with gas fuel approximately 83 per cent. One forced-draft and one induced-draft fan, each driven by constant-speed induction motor; automatic control of furnace draft. Steel stack 8 x 100 ft. high (above ground level), located adjacent to boiler and induced-draft fan.

tion at the same place or a second 1,250-lb. superposed unit at Deepwater. A topping extension at Gable Street was indicated as less favorable than a condensing, largely because of the higher unit cost and lower efficiency for the former. Furthermore, a good-sized topping unit would require extended operation of a considerable number of old turbines.

A comparison of 850 lb., 900 deg. F. with 650 lb., 825 deg. F. as steam conditions showed somewhat lower production costs plus fixed charges for the 850 lb. Excess investment for the higher pressure was estimated as about $2 per kilowatt for the 25,000-kw. extension, with better fuel economy more than compensating for greater fixed charges. The higher steam conditions were preferred as more consistent with expectable future practice, and because probable increase in fuel costs would further favor an economical plant.

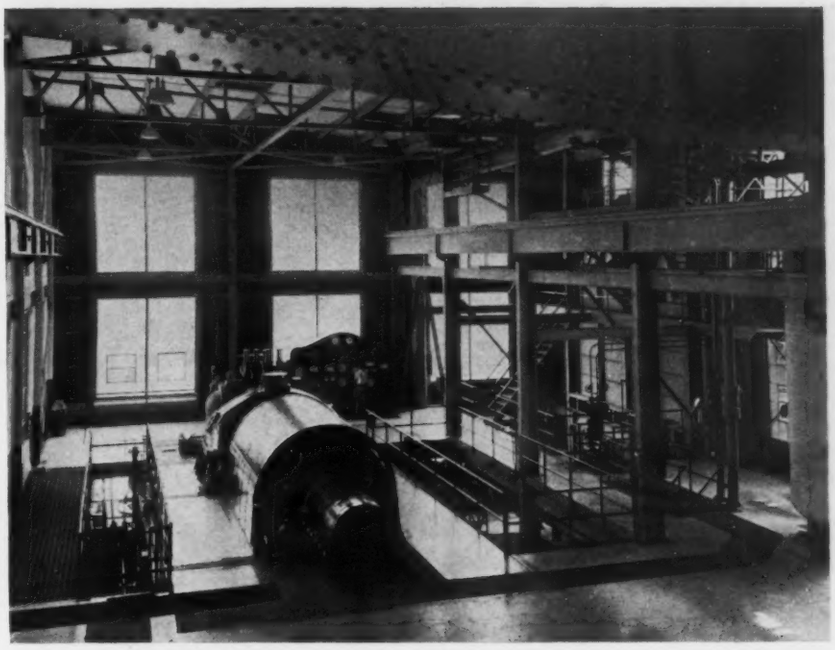


Fig. 4—3,600-r.p.m., 12-kv. turbo-generator, air cooled
Air rather than hydrogen adopted, as size of unit (25,000 kw.) is on border line for use of hydrogen.

Condensing Capacity Amplified

Installation of additional high-load-factor capacity required further development of water-cooling facilities which, supplemented by various devices, had been reasonably adequate for existing units. Flow in Buffalo Bayou, on which the plant is situated, is quite variable, sometimes dropping to a low value, and there is inadequate cooling surface available in stream adjacent to plant. For additional cooling of condensing water, comparison was made between extension of discharge conduit for a considerable distance downstream, provision of spray pond and use of cooling tower. The first plan would provide questionable cooling of condensing water; for the second scheme ground area was insufficient, and cooling at times of slow air movement in summer would be lacking. The third plan was accordingly adopted.

Experience in that region, with its considerable periods of low wind velocity during the hot season, had shown that a natural-draft cooling tower could not be depended upon for proper cooling during extreme weather, and that forced-draft towers were in general the proper choice in cases calling for dependable and efficient water cooling. The chief objection to forced-draft towers is high power requirement of fans. An advantage is relative compactness as compared with natural-draft type.

Cooling towers can be purchased with quite definite performance guarantees, including guarantee as to noise created by fans above sound level with fans shut down. Tower selected (Fig. 2), had twelve cells, for cooling of 57 c.f.s. of water through 16 deg. F. range, with 16 deg. F. approach to 76 deg. F. ambient wet bulb, which is usual summer maximum. Estimates for loss of water included 0.2 per cent for driftage and 1.2 per cent for evaporation.

Economical Structural Design

A clay stratum exists below ground level at the station site, and below this is water-bearing sand. It was found by driving experimental piles of various types that material encountered below basement level was of such character as to make driving of bearing piles extremely difficult, if not impossible. Recourse was therefore had to sheet piling around building extension, particularly on the side toward the river, holding sandy material in place and permitting placing of concrete slab on clay layer encountered immediately below basement level.

It was decided to extend the existing brick structure, using similar construction along the street side, but for the remainder of the building to utilize asbestos-covered corrugated sheeting, along the river side as well as for temporary end of turbine room (shown at right in Fig. 1).

Turbine room and auxiliary bay were made quite compact, to reduce building expense; turbine room was laid out 80 ft. long by 40 ft. wide, with height of 65 ft.; auxiliary bay was 20 ft. wide. Full protection for the firemen during normal operating service was provided, the firing aisle being located in the auxiliary bay. Induced- and forced-draft fans were placed outdoors adjacent to the boiler, with direct-driving motors protected from weather by compact housing. An approximate estimate for full housing of the boiler and fans by the simplest type of structure, using corrugated asbestos sheeting, had indicated an additional cost of about $50,000, well worth saving.

Single Semi-Outdoor Boiler Adopted

For the Gable Street extension consideration was given to the provision of two boilers instead of one, to provide greater reliability of output, and perhaps some little capacity over and above maximum required by turbine. However, the material saving in investment by use of one boiler, and adaptability of the unit offered for compact installation with low-cost semi-outdoor design, led to the adoption of a single unit (Fig. 1). Integral type and compactness of design are indicated in illustration. By-pass damper is shown, this providing for limited control of steam temperature.

Boilers now carry a reliability not far from that of steam turbo-genera-

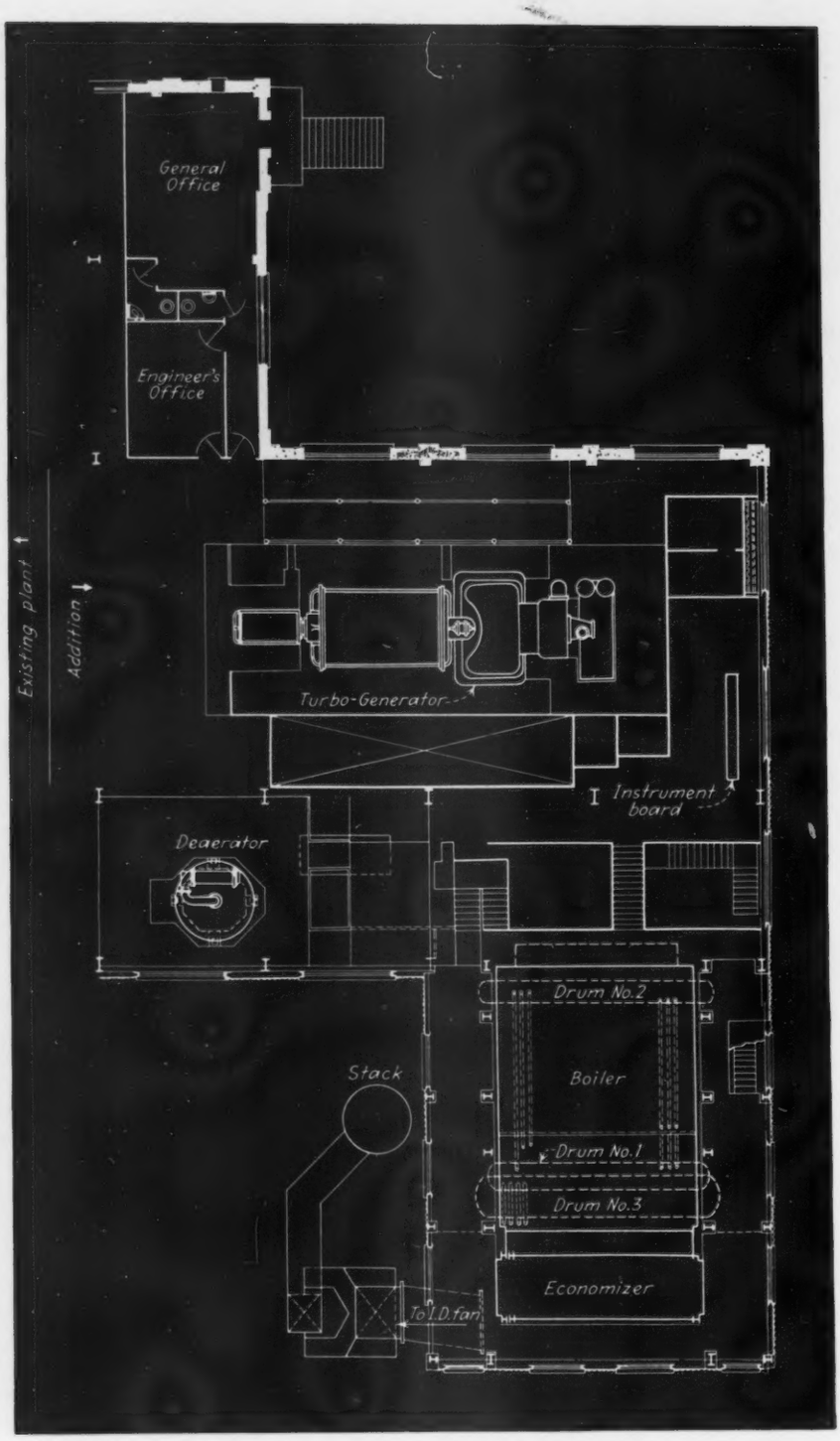


Fig. 5—Boiler operating station in direct view from turbine floor, although on lower level

tors, making it frequently permissible as well as economical to provide one-steam-generating unit only, per turbine. Older practice with respect to provision of spare boiler capacity has also undergone a change, in that the present tendency is to supply steaming capacity for turbine requirement only, with little or no spare capacity to provide for unscheduled or emergency boiler outage. This economy in number and size of boilers is one of the important items that has permitted reduction in unit cost of steam electric stations, as compared with the practice some years ago.

Since natural gas is nearly ideal as fuel, it would appear that a minimum of attention need be given to detailed design features of furnace and boiler. It is true that gas and many fuel oils render a boiler practically free from slagging and other fouling—which is a great gain as compared with results using most solid fuels. However, refinement in design of gas burner and furnace is necessary, as it is for a coal installation; provision must be made for proper turbulence and mixing of gas-air mixture, with a relatively low proportion of air mixed with gas at time of ignition. Care must also be taken to provide proper lighting-off facilities, and to assure stability of flame (especially at low boiler outputs), to do away with danger of flame extinguishment and possible puffs or furnace explosions.

Turbine Condenser; Single Circulator

The turbo-generator purchased (Fig. 4) was specified as 25,000 kw., 0.875 p.f., with maximum generation slightly exceeding that power rating when power factor of load is suitable. The boiler having been specified for 250,000 lb. of steam per hour, with some margin, there will be ample steam to produce 25,000 kw. under all reasonable back-pressure conditions, and more than this when lower back pressures become more practicable.

While efficiency guarantees were based on 2.0 in. (mercury) back pressure, 25,000 kw. carrying capacity was specified with full bleeding and with 3.0 in. back pressure—because of the heavy loads during summer. Plant heat balance was laid out, after comparing three-point with four-point extraction for turbine, for the former; an element in this was the use of an economizer, reducing the gain from the fourth bleed point.

Two-pass surface condenser was chosen rather than single-pass, to reduce circulating-water pumping energy required, particularly considering the high head—about 70 ft.—called for by the use of a cooling tower. Arsenical-copper tubes were selected because of expected alkalinity of water. Performance was predicated on 0.85 tube cleanliness. For economy in investment, it was decided, in view of the reliability of circulating-water pumps and driving motors, to adopt one pump rather than two. However, two condensate pumps were specified.

With 83 per cent boiler efficiency, the extension plant economy was estimated at 12,800 B.t.u. per kilowatt-hour net output at 20,000 kw. load, with 2.0 in. back pressure. Recent installations have shown results at least as good as "bogey" figures.

Circuit Layout for a Heat-Treat Department

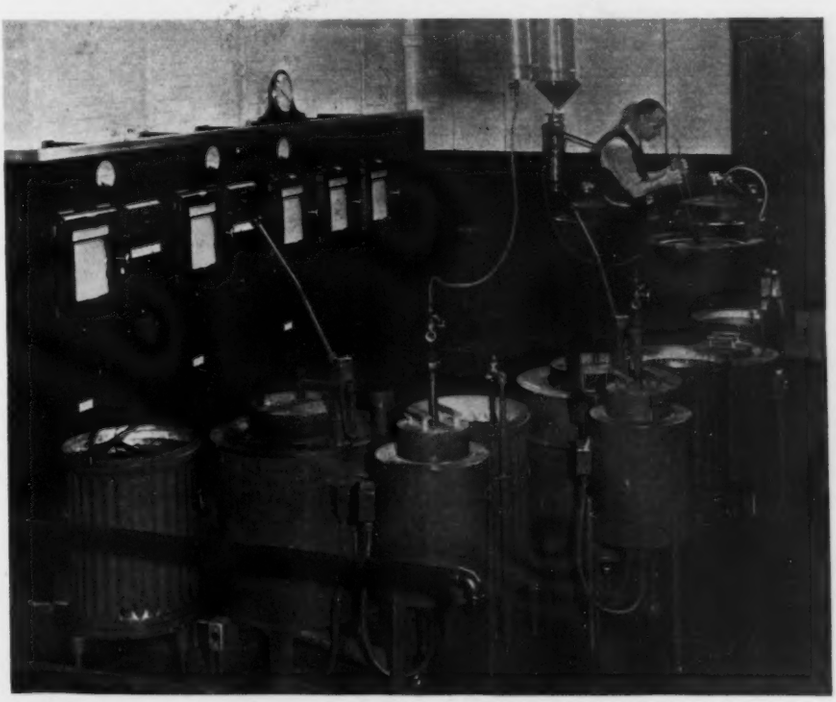
Special circuit features, definite load allocations, placing of units and control arrangement are devised for 50-kw. typical heat-treatment apparatus in a plant devoted to instrument and furnace fabrication

W. R. COLEY, *Factory Manager, Leeds & Northrup Company, Philadelphia*

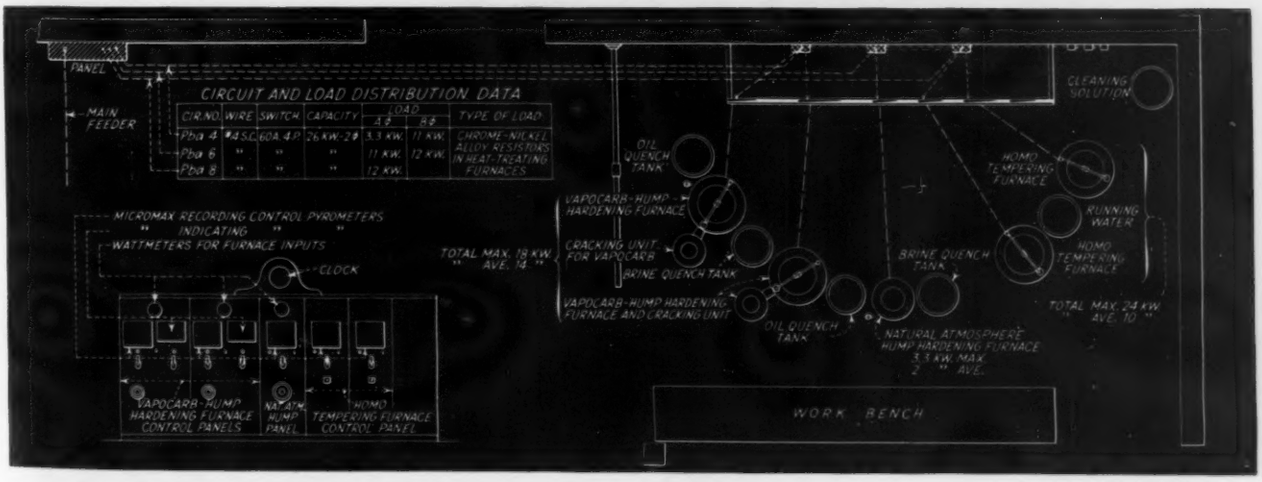
CONVENIENCE of location for sequential operations is an important matter in any installation of heat-treatment furnaces to perform a multiplicity of functions. Equally important are visibility of the graphic instruments on the control panel and adequacy of the circuits supplying the furnaces. That these objectives are readily met is exemplified by an installation at our own works, where five furnaces, with their supplementary quenches, rinses and oil crackers, are used to treat instrument parts. The semi-circular arrangement with the control panel across a diameter serves two of these objectives and the third was met by installing three No. 4 two-phase circuits.

The two Vapocarb-Hump furnaces are each rated 220 volts, 35.9 amp. and 7.9 kw. Each has an electric oil-cracking still which requires 2.1 kw. These stills crack the special Vapocarb fluid which provides the gas for the non-oxidizing atmospheres in the furnaces. Each furnace requires the cracking of about 1 gal of oil per week for continuous operation.

In conjunction with the two Homo tempering furnaces (each 12 kw.) there is a 1-kw. immersion heater provided to raise the temperature of the quenching brine if circumstances require.



Heat-treatment furnaces arranged in convenient semi-circle
Heat and quench tanks alternate. Panel instrument visible from work location


PANEL
CIRCUIT AND LOAD DISTRIBUTION DATA
MAIN FEEDER
CIR. NO. | WIRE | SWITCH | CAPACITY | LOAD A-B | LOAD B-B | TYPE OF LOAD
Pba 4 | #4 S.C. | 60A 4P | 26 KW-2Ø | 3.3 KW. | 11 KW. | CHROME-NICKEL ALLOY RESISTORS IN HEAT-TREATING FURNACES
Pba 6 | " | " | " | 11 KW. | 12 KW.
Pba 8 | " | " | " | 12 KW.
MICROMAX RECORDING CONTROL PYROMETERS
" INDICATING " "
WATTMETERS FOR FURNACE INPUTS
CLOCK
TOTAL MAX. 18 KW.
" AVE. 14 "
VAPOCARB-HUMP HARDENING FURNACE CONTROL PANELS
NATURAL HUMP PANEL
HOMO TEMPERING FURNACE CONTROL PANEL
OIL QUENCH TANK
VAPOCARB-HUMP HARDENING FURNACE
CRACKING UNIT FOR VAPOCARB
BRINE QUENCH TANK
VAPOCARB-HUMP HARDENING FURNACE AND CRACKING UNIT
OIL QUENCH TANK
NATURAL ATMOSPHERE HUMP HARDENING FURNACE
3.3 KW. MAX.
2 " AVE.
BRINE QUENCH TANK
CLEANING SOLUTION
HOMO TEMPERING FURNACE
RUNNING WATER
HOMO TEMPERING FURNACE
TOTAL MAX. 24 KW.
" AVE. 10 "
WORK BENCH

Three No. 4, 220-volt circuits supply battery of furnaces with average demand of 28 kw.
Furnace load, 45 kw. max., 26 kw. average. Panel load, 1 kw. max., 1 kw. average. Miscellaneous heating: 3 kw. max., 1 kw. average.

Commercial Cooking Load Held by Customer Service

Kansas City sells seventy per cent through dealers, inspects installations quarterly, and provides 24-hour service to customers

GORDON B. KOCH, *Commercial Sales Department, Kansas City Power & Light Co., Kansas City, Mo.*

AS EARLY as 1926 our company realized the value of the commercial cooking load and began an active promotion, centering it in Kansas City, Mo., then a city of approximately 400,000 people. During twelve years of promotion in this one field our public bought equipment to a total of 6,108 kw. and averaging 1,674 kw.-hr. per kilowatt. Despite the high mortality of the past eight years, the records indicate that at least 90 per cent of this load is still on our lines. This means that although our growth has not been spectacular, it has been steady, and shows the results of the careful attention given to the equipment and service rendered to our customers—and business retained is more valuable than new business gained.

Job Gets Bigger

In the beginning of our promotion one engineer devoted only a part of his time to this work. As the market expanded, new men were trained for the work until there were three men spending 50 per cent of their time developing new business and selling equipment. The remainder of their time was given to the handling of contracts, rate adjustments and analyses; in fact, all contacts with the restaurant and hotel industry. The chief advantages in having men specializing in one particular industry were (1) the intimate knowledge gained of the problems connected with the industry, as well as (2) a close friendship with each customer. When specific problems involving lighting, competitive power or air conditioning arose the cooking men had the assistance of other engineers whose work was concentrated in those particular fields. The disadvantage of this type of operation proved to be the great amount of detail necessary in handling all these phases of customer relations, which often short-circuited the selling of equipment.

Gordon B. Koch

Early in 1938 the entire city was divided into districts and plans were put into effect for all-service selling. By having fifteen district salesmen we are now getting a much better coverage of our customers, even though commercial cooking promotion is only one phase of the work. These district men have been trained in the advantages of commercial cooking and baking equipment and are constantly producing prospects which are turned over to the cooking and baking division, composed of a specialist, who supervises all installations and handles the major installation type equipment and sales, and an assistant, who spends his entire time demonstrating and selling counter equipment.

After the Sale

After the district men have analyzed the needs of their customers it becomes the duty of one of the cooking and baking division men to call on them and attempt to close the sale. The sale completed, it again becomes the responsibility of the district men to keep close contact with the customer and, in case of any dissatisfaction, seek the aid necessary to correct the trouble.

Much more might be said concerning the details of these two plans, but as neither is new to the industry, it would seem more helpful to deal with certain fundamental principles of operation which in our estimation are essential to the success of any plan of promotion.

Service First, Sales Follow

We believe a man engaged in the commercial cooking promotion should be more than an engineer with a rate book and a catalogue. Of primary importance is a knowledge of the food service industry, from the small hamburger stand to the large hotel and institution. The power company representative must know the language of the industry. This involves a working knowledge of the chemistry of food preparation and the effects of electric cookery. Proper preservation of foods is a field which should be thoroughly understood, as electric food preservation equipment is to cooked and baked foods what electric refrigeration is to uncooked foods, and should be as universally accepted. He should know how the restaurateur spends his gross dollar —what part is apportioned to raw materials, labor, cooking costs, etc., what are the expected shrinkage in raw materials and the waste in preparation, as well as the effects of combustion fuels on the efficiency of labor, decorations, and air-conditioning costs.

Without a background of actual understanding of these problems we can never hope to be of any great assistance to our customer in helping

him appreciate the tangible and intangible benefits of electric cooking and baking equipment.

The prestige and standing of the power company representative in the minds of his customers can be enhanced and his effectiveness increased if he is allowed to analyze thoroughly each prospect's location possibilities and food preparation equipment needs before making a recommendation. This type of operation does not lend itself to campaigns designed to sell a particular item of equipment each month. Where bonuses are paid as rewards for campaigns it is generally found that too often the salesman's attention is diverted, and naturally he will concentrate his efforts on the equipment that will produce the most attractive additional income for himself. Therefore we prefer to pay our representatives a straight salary for their service and sales effort and upon a mileage basis for the operation of their cars. This method of compensation gives complete control over the methods used by the men.

The first responsibility of our representative is to be certain that each customer is entirely satisfied with the equipment and service he is using at the time of the call. If he is bothered with the cost of his service, an air conditioning or lighting problem, we immediately get the proper assistance to take care of these needs *before* approaching the electric cooking idea or visiting the next prospect. In this way we are able to win the confidence of our customers and are in a much better position to secure their acceptance of electric cookery ideas. Service first always—sales follow!

Dealer Co-operation

Utilities are confronted with the problem of selling equipment themselves or depending upon the equipment dealers to make the sales. Much can be said on both sides, and the final decision will probably be based upon the degree to which the dealers are willing to give aggressive co-operation to the promotion of this business. To make sure that electric equipment has its proper place in the customer's consideration of new methods and equipment, we have maintained a policy of direct merchandising.

Surprising as it may seem, our dealers have welcomed us as a competitor because they know that we will always maintain list prices which allow them to make a normal profit. Also, since electric equipment generally has a higher first cost, the dealers can always look forward to a larger sale. The dealers in Kansas City, Mo., actually sold 70 per cent of all electric cooking and baking equipment installed in 1938, which indicates a high degree of co-operation. By maintaining a policy of selling equipment we are able to keep the dealers alert to the possibilities of electric equipment sales.

Aids to Effective Selling

When it becomes necessary to trade a customer out of an obsolete or inefficient piece of equipment it is always advantageous for the utility to be in a position to handle the business which generally does not represent a very profitable sale to the dealer, yet means additional load for the utility.

Demonstration of equipment is the most effective way of adding new load, for many times the equipment is a much better salesman than the power company representative. Wherever possible we use a portable wiring kit and let our customers convince themselves that the unusual savings and benefit we talk about are really true. After a successful demonstration the customer is much more responsive to our next suggestion, and the ground is prepared for the sowing of the seed of complete electric cookery.

It is far more important to retain the load already sold than to gain new load. For this reason approximately 30 per cent of our time is spent in instructing the restaurant people on the use of the equipment and its proper care. It is necessary to follow up constantly to be certain that the equipment is in good working order and is being used to its fullest advantage. Unless this is done, some of the business will boomerang and cause considerable trouble. Therefore we have found it necessary to have all of our cooking customers visited at least four times a year.

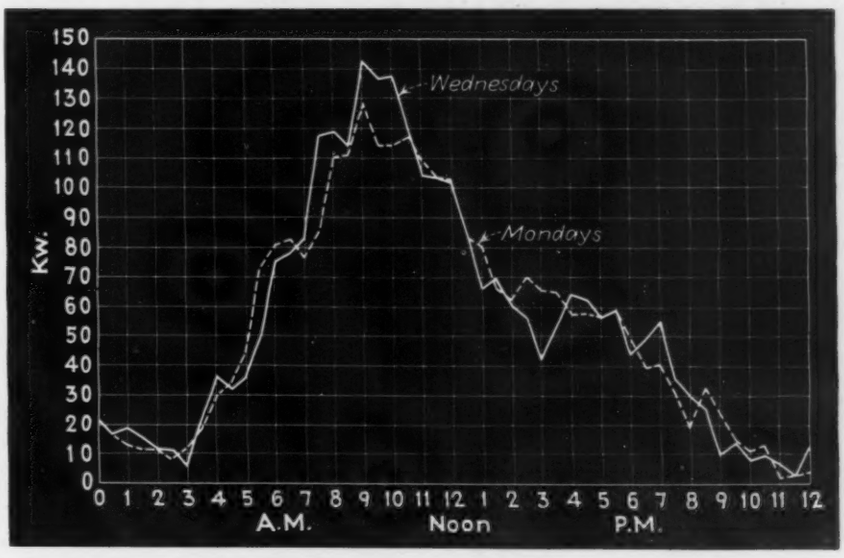
One of the most important aids in the retention of this business is good equipment service. In order to accomplish this we had to establish our service department and specially train men to give prompt and efficient service 24 hours a day. Every manufacturer we represent has signed a service agreement and is co-operating with us. We are equipped with a stock of parts, testing equipment and loaners to meet any emergency.

An outstanding service rendered by this department is a quarterly inspection of all major equipment and all counter equipment having thermostatic control. We find by this method that we have been able to sell the customer on keeping his equipment in good condition, at the same time giving the sales department a constant check on obsolete equipment which should be replaced.

Value of the Baking Load

There seems to be a great difference in the opinions of utility officials as to the value of commercial cooking and baking loads, and in

[*Continued on page* 54]



Typical daily operations complementary to system peaks and help improve system demands

A Decade of Experience With District Representative Plan

Increasing revenue, increasing average bill, selective load building, vast improvement in customer relations and particularly good results from low-income group reported for a ten-year test period

L. F. RIEGEL, ***General Sales Manager, Gulf States Utilities Company, Beaumont, Tex.***

BACK in the dim, distant past of 1926 or 1928, whenever utilities sales executives got together there was apt to be some discussion regarding the practicability of "the District Representative Plan"—the plan which combined, in varying degree, the duties of appliance selling, meter reading, collecting and public relations into a single job. Our company was one of relatively few to adopt the plan, and it is our impression one of fewer still to stick to the plan through thick and thin during a hectic decade ending with 1938.

We were tempted many times to abandon our convictions and stray off on experimental tangents and try this or that plan, that promised to produce more sensational results so far as immediate sales were concerned. However, as we were unwilling to sacrifice what we considered the *plus* features of the District Representative Plan, we stuck to it. And now we submit to the industry, for what it may be worth, this report covering ten years of operation.

Many leaders of the industry have in recent years placed a great deal of emphasis on the importance of load building through the sale of major appliances to the low-income group. We do not profess to be specialists in disposing of merchandise to this particular group. But we have been reasonably successful in this field, particularly in view of the low operating cost of competitive devices using 1,000 B.t.u. natural gas, which sells in this territory at 70 cents a thousand cubic feet and lower.

We were one of the first to go after low-income business, and during the depression sold some 5,000 "Liftop" refrigerators, plus thousands of irons, I.E.S. and "Pin-It-Up" lamps, and other appliances, mainly to customers who could reasonably be labeled "low income."

L. F. Riegel

The District Representative Plan, in addition, has enabled us to do a job of *selective* selling, securing *complete coverage* of customers served. Selling merchandise, after all, whether it be major or minor, is but a means to several ends. One end we have kept foremost in mind is "public relations."

No cold canvasser and no district representative whose remuneration is dependent upon commissions can afford to be too particular in selecting merchandise to fit the customer. Being human, they are apt to skim the cream.

The straight salaried representative—each one of ours is, although he does have a merchandise bogie to make—must be more particular, because his chickens come to *roost on his own doorstep,* either as satisfied customers or in the form of high bill complaints, delinquent accounts and reverts. He knows that because it wants to stay in business, the company values customer satisfaction as highly as it does kilowatt-hour increases.

During the ten years covered by this report Gulf States operated in a territory in south and southeast Texas and southwest Louisiana. Last summer the properties of Baton Rouge Electric Company and Louisiana Steam Generating Corporation were consolidated with those of the company. But because comparable figures are not readily available, and the other companies were not, for reasons not relevant to this story, 100 per cent District Representative Plan, we limit this discussion to that part of the present company where the plan has had a ten-year trial.

Results of Plan

Almost 30 per cent of the population is negro. Approximately 45,000 residential customers are served. Throughout the territory there is the cheap natural gas competition. Beaumont and Port Arthur, Tex., and Lake Charles, La., are the only communities that may be classed as metropolitan. About half of our customers are in these centers, the other half are found in small communities in a territory 300 miles long. During the depression things went along on about the same relative basis here as in the rest of the country. In this territory we have, by sticking to the District Representative Plan:

1. Increased our kilowatt-hour consumption per home customer from 419 in 1929 to 1,025 in 1938, compared to the national average for 1938 of 850 per customer. During

An oil field employee lives here. His wife has both an electric range and an electric refrigerator

The highway department employee who lives here enjoys both electric cookery and electric refrigeration

the decade we came from 16.0 per cent behind national average to 20.5 per cent ahead, and this right in the heart of a high B.t.u. content natural gas area, where prevailing rates are very low.

2. Secured (by actual count) a saturation of 59.5 per cent for electric refrigeration.

3. Secured (by actual count) a saturation of 13.9 per cent for electric cookery.

4. Secured (by actual count) a saturation of 4.6 per cent for electric water heating.

5. Increased revenue per home customer per year from $37.57 to $44.24, while the average price per kilowatt-hour for residential service was dropping from 9.8 cents to 4.3 cents.

We believe these results, while not phenomenal, can be classed as substantial in view of the fact that:

1. District representatives devote only part time to selling.

2. District representatives receive salaries, no commissions. We do offer prizes in special campaign contests. In 1938 these prizes totaled approximately 2 per cent of gross merchandise revenue.

3. The terms on which they were required to sell were in line with standard practice of finance companies, so dealer competition was on a fair basis.

4. Although the number of residential customers increased 70.3 per cent during the ten years, there was no corresponding increase in personnel — evidence of the value of the plan so far as cumulative effect is concerned; that is, over a period of time a district representative makes his territory more productive in sales, although the increase in customers cuts down the time available for contacting individual customers.

5. The plan is ideally suited to building load in the lower brackets as the district representative, being familiar with the needs of his customers and their ability to pay, is in a better position than the cold canvasser to do intelligent selective selling of major and small appliances and lighting. The fact that he is, also, responsible for merchandise collections serves as a check against over-selling low-income customers, with resulting reverts and ill will.

6. As evidence of the soundness of the plan from the standpoint of No. 5, we submit that only 6 per cent of merchandise accounts are outstanding at the end of 30 days.

It may seem that we have been guilty of a let's-let-well-enough-alone frame of mind in sticking to the District Representative Plan. Not at all.

Completely Balanced Jobs

Our view has been that this plan assures steady, substantial growth that leaves:

1. The customer satisfied because he or she isn't high pressured into purchasing.

2. The dealer satisfied because the electric company gives him fair competition and co-operation.

3. The salesman satisfied because he received renumeration regularly for reasonable results.

4. The management satisfied because: (a) of substantial growth in load; (b) freedom from—or at least a minimum of worry over—customer complaints resulting from pressure methods; (c) minimum of difficulty with dealers over company's merchandising policies; (d) low percentage of reverts; (e) good collections; (f) accurate meter readings and fewer skips.

This *balanced* result, we feel, is more to be desired than immediate results in load building alone. We know our saturation figures are accurate because five years ago we became dissatisfied with the general practice of adding all company and dealer major appliance sales to the saturation figure.

In 1933 we made an actual count of major appliances connected to our lines, and each year since, in August, we have made this count. So our saturation figures are based on refrigerators, ranges and water heaters actually in use. The district representatives handle the census along with other routine, thereby eliminating all guesswork as to the number of appliances sold as replacements and the number traded out after a few months.

No doubt many companies can present figures that are more impressive than these, show better sales and load-building results achieved with a commission plan, or other plan. We do not even claim that all of our results are better than national average. We simply offer them as a

An electric range and refrigerator make life better in home of this oil field worker

Electricity does both the cooking and the cooling in the home of a lumber company employee

District representatives take such campaign merchandise as I.E.S. lamps along, saving the housewife a trip to the store

factual ten-year report on the District Representative Plan, on a strictly salaried basis, as it worked out for one company. Our district representatives handle the full line—we have no specialty men.

How It's Done

Service, collections and other matters of vital importance to the company are discussed at regular sales meetings, along with sales plans and results. Supervisors follow these related matters closely in their daily contacts with the district representatives.

We have the usual range, refrigerator, water heater and I.E.S. contests, with worth-while prizes for those doing a better than average job. However, as previously pointed out, these prizes amount to only a very small percentage of gross merchandise volume and added revenue.

In addition to our monthly sales meetings in the various divisions of the company, we hold semi-annually sales meetings which are attended by all members of the sales department and by key men in other departments. Mutual problems, as well as those that have to do strictly with sales, are discussed at these meetings. We do not as a rule ask employees of other departments to do our selling job for us, but their co-operation is vital to our success, and their attendance at these meetings contributes to the creation of a spirit of co-operation and better results. The exception to the rule is found in one division which comprises smaller communities, where operating and accounting employees pitch in now and then and help us to do a special job—and how they do help!

The District Representative Plan we have found does exactly what its advocates claimed a dozen years ago that it would do.

With this plan *every customer is a prospect*—for something electrical. Those that are possible buyers of major appliances receive preferred attention, naturally, from the district representatives, whether they are in the low or the high income bracket.

From constant contact with his customers the district representative knows which ones *want* major appliances enough to afford them. And while he is trying to create a desire for ranges and refrigerators and water heaters, he has an opportunity to sell them their immediate needs.

We unhesitatingly recommend the District Representative Plan—"the plan that has everything"—to companies wishing to develop major appliance sales in the low-income group. It does the job—plus.

Per Cent of Saturation on Major Appliances

Date	Ranges	Water Heaters	Refrigerators
1933	6.8	1.1	25.4
1934	7.3	1.1	30.8
1935	9.2	1.7	42.6
1936	11.3	2.7	50.9
1937	13.2	3.8	57.2
1938	13.9	4.6	59.5

Average Kilowatt Hours per Home Customer

Date	Company	Industry Average
1929	419	499
1930	496	543
1931	568	578
1932	610	597
1933	613	595
1934	659	624
1935	764	672
1936	868	727
1937	972	793
1938	1025	850

Average Annual Bill per Home Customer

Date	G.S.U. Co.	Industry Average
1929	$37.57	$31.44
1930	37.87	32.58
1931	40.37	33.18
1932	40.37	33.25
1933	40.83	32.67
1934	41.29	33.07
1935	42.43	33.53
1936	43.98	33.81
1937	44.02	34.81
1938	44.24	35.70

Commercial Cooking Load Held by Customer Service

[*Continued from page* 51]

order to convince ourselves of the true values we have made an investigation of the way our loads have been reported and their value to the company from a system-demand standpoint.

During the last twelve years the 6,108 kw. we have connected to our lines have averaged 1,261 kw.-hr. per kilowatt connected, with an estimated annual revenue of $34.71 per kilowatt connected.

To arrive at these figures each individual installation has been reported on the basis of the actual hours use at the time of installation. We have found that this is not always a true indication of the usage and revenue we can expect from this load, for after six months of operation many other uses for the equipment may have been found, thus lengthening the hours usage over that first reported.

For this reason we have conducted a study of this load by placing watt-hour meters and demand meters upon a variety of equipment covering the counter and installation groups, which showed us that we are receiving 1,674 kw.-hr. per kilowatt connected, and we are prone to believe that this is more representative, as these installations were carefully chosen in order to give a representative picture of the load.

Another interesting feature of this study was revealed by the superimposing of the demand charts on the same days and half-hour peaks, which showed that out of the 298.01 kw. connected investigated on this test we had a simultaneous demand of 142 kw. This would indicate that the annual kilowatt-hours of simultaneous demand would be 3,513.5 kw.-hr., which, from the standpoint of system demand shows a diversity on this load of 47.6 per cent.

The use of simultaneous demand in respect to this test may be questioned since the tests were not all started at exactly the same time, having been taken over a six-month period. For all practical purposes, however, we believe the analysis is representative since it took into consideration the variance caused by seasonable business.

Modern Lighting Enhances Church Architecture

Yesterday's way of lighting a church is garish and unattractive in the eyes of today that look for a pleasingly complementary relationship between architecture and illumination

FRANK H. JONES, *Illuminating Engineer, Lowell Electric Light Corporation*

ABOUT three years ago the pastor of the Sacred Heart Church in Lowell (Mass.) realized that the lighting of the edifice, while beautiful and effective according to earlier ideas, was distracting, inadequate and unattractive when measured by modern standards. Considerable glare prevailed and the existing design of the equipment made it uneconomical in use. Several solutions of the problem were available, but most of these involved extensive and expensive alterations which were in themselves not entirely satisfactory. With the assistance of the lighting division of the Lowell company, a subsidiary of the New England Power Association, a solution was finally effected at a total cost of about $2,500 for equipment, wiring and installation which resulted in a considerable improvement in illumination and a newly discovered beauty in the church interior.

The chancel and altar afforded an unusual opportunity for the application of advanced lighting technique, and this was probably the most interesting phase of the entire project. In general, the intensities were increased from 2 to a maximum of 12 ft.-candles at the altar and from maxima of 1.5 to 5 ft.-candles in the nave. The switching facilities provide for varying the lighting effects as desired, and the reflection factor of the white surfaces in the chancel is about 70 per cent.

The desired effects in the chancel were obtained by directing the light into this area from three types of reflector equipment concealed back of the chancel arch. Open and diffusing reflector designs provide the necessary general illumination and "controlens" furnish the high-lighting effects. Cove lighting at the top of

[*Continued on page* 115]

Shadows and glare impaired the interior lighting before modernization, whereas higher intensities and glareless lighting properly directed raised the architectural tone and beautified the interior of this church

Editorials

S. B. WILLIAMS, *Editor*

Preparation for Technical Man-Power

WAR has broken out again in Europe. President Roosevelt has said that he thinks there is no need for the United States participating. Such also is the prayer of every family and every business that is not willing to build on human suffering and destruction.

Nevertheless, there is always the possibility, as in 1917, that we may not be able to remain neutral. Against that time the electric industry should always be prepared.

Nor is preparation entirely a matter of sufficient physical capacity to turn out kilowatt-hours or equipment. The greatest shortage that this country experienced in the World War will be even greater should we get into the present conflict, namely, trained men.

For several years there has not been a steady absorption by the electric industry of large numbers of young technical men. Were we to go to war tomorrow we would immediately feel this shortage both at home and with the fighting forces.

Impractical as it may be from a dollars and cents management viewpoint, it might be most practical as a war preparedness measure to put to work in our utility and manufacturing operations all of the unemployed recent technical graduates.

The industry can do a great good for the country, and for itself as well, to pray for peace but prepare for war.

Capacitors Stocked for Duty

ONE HEARS of utilities that are now buying capacitors and putting them into storeroom stocks to be requisitioned when needed. Others are mounting capacitors on chasses for ready shift to system locations where their influence would help out the performance and relieve congestion.

It has taken a long time for capacitors to approach this degree of parity with transformers. The latter have long been kept in stock and long been mounted for temporary substation use. But it has only recently been recognized that capacitors have a definite function in transforming load characteristics and transforming voltage *behavior* just as transformers have in transforming voltage *level*.

They are further being recognized as transforming the ideas of engineers as to the most economical ways of meeting temporary and uncertain load conditions. In some cases it may well prove cheaper and better to increase wire size, or voltage or transformer capacity. In other cases it is equally true that it can be cheaper to boost the line's ability to carry load by capacitors, especially if there is no assurance that the load or the adverse conditions are to be permanent. Cost reduction to one-fourth the unit price of fifteen years ago has been a large factor in stimulating their use as reliable expedients. There was a time when up to 80 per cent lag was as far as one could ordinarily go in improving power factor. At present costs and performance it is not uncommon to find capacitors justified to unity power factor or better.

It is in this way that capacitance is becoming accepted more definitely by the distribution engineer as a working tool to be used interchangeably with more copper, more transformers or additional regulation devices to hold the voltage up and the current down to productive values.

Tax Collectors in Theory But Not in Fact

IN A recent editorial the Milwaukee *Journal* criticises the utility industry for complaining about its tax burden and points out that utilities are not taxpayers, but tax collectors. Such a statement is partly right and partly wrong. There are certain taxes that are assessed directly against the property of utilities. These the companies pay. Then there are taxes levied against sales. These presumably the customer pays, and in such instances the utilities are looked upon as tax collectors.

But it doesn't work out that way. It should, perhaps, but the facts are that the customer has no recollection of paying the tax as he does when he buys gasoline or writes out a check. If the tax is increased, the energy rate is not increased proportionately—the difference comes out of the utility treasury.

We are in favor of having the industry act as a tax collector, provided some way could be found to put the tax on the customer's bill and have it paid over and above the rate for energy. Because the utility industry contacts more homes with fewer units than probably any other industry and has besides a measurable service, it naturally is an ideal tax-collecting agency.

However, it is erroneous to think that the industry is a tax gatherer in the true sense, simply because the rates might be lower were it not for the taxes. The taxes have been levied and it has been up to the companies to find the wherewithal to pay—not the customers.

Rates couldn't be raised so economies had to be found in other directions.

Perhaps rates might have been further reduced had taxes not been so high, but, if so, there would have been an advantage to the companies through better customer relations and a greatly extended market. With taxes, both of these are denied the companies, so again the companies pay.

The theory of government is that the customer pays. In utility practice, he doesn't, but he should. The question is how. If some practical way could be worked out, better relations might exist between government and utilities and rates might better reflect the economies of modern utility management.

Significance of Output Curve Trend

NEWSPAPERS and others seem to have attached unusual significance to the fact that a new all-time peak for electrical energy output was established in July. As a matter of fact it is in July that a new output peak is generally established for the first time each year. So it happened in 1935 and in 1936 and in 1937, all years of rising demand.

Up to July the daylight hours are gradually longer and the hours of lighting correspondingly less. Then in July the situation turns about. Also, the industrial load has established a summer peak. From that point the increasing lighting load adds on month by month, bringing a peak at the time of the shortest daylight.

So the appearance of the July peak, while welcomed as a harbinger of good business, is nothing to be unduly excited about. The one thing to get jubilant over, however, is the fact that the form of this year's output curve not only follows closely that of former good years but appears to be faster in growth. So far there is no mistaking its trend.

Since this curve is of particular interest to those who supply equipment and materials to utilities, it might be well to point out that in past years, whenever the curve has taken this shape, there has been a decided pick-up in utility buying. Buying doesn't begin at once, particularly after a lapse such as happened in the last half of 1937 and the first half of 1938. It gathers momentum with duration. Thus if past experience is any guide, and we point particularly to 1936-37, utility buying should improve progressively.

The improvement in output was first noticeable in May last year. Since then the trend (with due consideration for seasonal load) has been upward—a matter now of some fifteen months. The previous rise that brought the feverish buying of '36 and '37 started feebly in 1934, but didn't get noticeably under way until the middle of 1934.

The same situation may not develop at this time because of the European situation, which momentarily might affect the trend of the output curve. Should such a retarding effect be short, as seems probable, the upward trend of the curve cannot help but bring considerable promise to all suppliers.

What Is Good for One Is Even Better for the Other

ONE of the criticisms leveled at public ownership has been that it is subject to no one. Under such conditions the public has no assurance either of good service or of electric rates that truly reflect costs without subterfuges, other than the integrity of the administration then in power. Apparently now the several state utility commissioners have come to recognize this situation, for at the recent convention of the national association it was announced that a majority of state commissioners were in favor of according the same regulation to all utilities, irrespective of the character of ownership.

It seems strange to us that municipalities should object to the regulation that they demand of private companies unless the city fathers intend deliberately to fool the public.

The worst opponent to state regulation, however, is the United States government. It insists on imposing double and triple regulation on privately owned utilities, but refuses itself to abide by anything like the same rules.

One of the best examples of this is the fight waged by REA against state regulation of rural co-operatives. It is reported that REA has threatened, where the law seemed to apply, to withhold REA money from the state if the co-operatives had to be subject to state regulation. Why, we wonder? Is there something about the operations of REA co-operatives that will not bear inspection? Or is it possible that state regulation might disclose that rates would have to be raised to make the project pay out?

There is no fundamental reason why a publicly owned project should not succeed just as well as one that is privately owned. Both use the same products and same materials. However, so long as human beings, actuated by one motive or another, are necessary to operate utility properties, they must be policed. In the case of publicly owned utilities it is even more necessary because they have caused a change in local ownership based on certain promises. The only way the public can know whether or not these promises have been fulfilled without resort to subterfuge of one kind or another is through regulation.

We hope that this investigation by the National Association of Railroad and Utilities Commissioners does not end with the report. Laws bringing these publicly owned utilities under regulation should be enacted in every state.

War Power Politics

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

IN RED INK on the agenda, to be rushed through Congress when and if the United States gets into the war, is the taking over by the government of the entire electric utility industry of this country.

And by the way, it's "when" in the lexicon of the New Dealers interested, not "if." The timing of "when" depending on how long it takes disregard of neutral rights to stir sentiment in this country up to the boiling point.

Remember the railroads, taken over by the government in the last war? Remember what happened to them? What happened to the people who owned them? And has been happening ever since largely as a combination of what was done to them then and government regulation since?

But the agenda item for the taking over of the utility industry has one important difference from that seizure of the railroads. There is no thought whatever of ever turning the utilities back to private operation when the war emergency is over. Or at any other time. The thought is to nationalize them forever. Tennessee Valley Authority *uber alles*. Notice that word: "Authority"? Don't ever forget that it means just what it says.

An Excuse, Not a Reason

New Dealers don't care for state lines very much anyhow. They cramp one's style in governing the people for their own good. Too many states seem to have majorities that don't appreciate the aims and objectives of a benevolent federal bureaucracy. Their failure to "co-operate" in the purges was deplorable.

Of course the intention is to ask for this power—just as the seizure of the railroads was asked in the world war—on the ground that it is a vital war measure. The actual fact that the two cases are not comparable has nothing to do with the case. The men behind this move, the men who have put it on the agenda, are actually far more interested in the nationalization of the utility industry than they are in war plans. War emergency will be the excuse, not the reason.

Plans for it were begun long ago. Before Munich, as a matter of fact. One of the first open steps was that huge study of electric power, interconnecting lines, etc., on which a huge force has been working, in war-like secrecy, since the war clouds began to gather.

Just consider the actual difference between the railroad situation in 1917 and the power situation now.

During that severe winter of the first year of our participation in the war the railroads almost collapsed. The weather, plus trucks for whose weight and force the roads had not been calculated, had made our highways sorry substitutes for the steel roads. The rush of getting our own troops and supplies to Atlantic seaports and keeping up that vital flow to the hard-pressed allies was terrific.

So the government took the roads over—*more to get the railroads out from under government regulation which prevented co-operation between independent railroads than for any other reason.* The most ardent enthusiast for public ownership of railroads would not contend that any *other* advantage was gained. Had the war gone on much longer that one advantage, important though it was, would have been overshadowed by the stupid inefficiency of government operation.

There was no argument about that—after the war. Some of the most ardent government ownership advocates admitted sadly that this war-time operation of the roads had "put back the cause of government ownership for fifty years."

Look at the electric utility industry—now! It is extraordinarily efficient. It has a capacity for increasing the supply of power beyond any present dreams of war needs, allowing, of course, for the logical diversions of its use from non-essential purposes. This last statement is really unnecessary save that advocates of nationalization will never mention publicly that this transfer of the uses of power would come automatically in part, by compulsion the rest of the way.

Industries which will be classified as non-essential will come pretty close to closing down anyhow. Shipments of all materials were rationed to them in the last war, will be in the next. It is just as simple to ration power as to ration coal, and who, alive at the time, will ever forget the heatless Mondays, the gasolineless Sundays, and the rest of it? Remember when it was "unpatriotic" for a passenger automobile to be on the streets on Sunday? When office building elevators were restricted as to hours to save coal?

Let Congress Know

Everybody in the utility industry knows already what a ghastly farce nationalization of the industry would be, both from the standpoint of national defense and for the welfare of the people of this country afterward—not to mention the taxpayers as a special class.

But Congress does not have the picture.

Men and women interested in the utility industry could do no more patriotic task during the months to come—during that turbulent period of neutrality which seems ahead—than to make sure that their own senators and representatives understand what the situation really is. How well prepared the electric utility industry is to take on the extra load which entry of the United States into the war will bring when and if it comes.

The industry, incidentally, should watch its step during this neutrality period from another angle. Demands for power will soar, even during this period, for reasons pointed out at length in this writer's last article in ELECTRICAL WORLD. During this period the men and women who are just waiting for the opportunity to force government ownership on the electric utility industry will do their utmost to play up the slightest bits of

[*Continued on page* 116]

NEWS OF THE WEEK

Rising Commodity Prices Affect Utility Expansion

Executives consider rising trend in formulating future expansion of plant facilities — Government agencies ready to aid industry in emergency — Capacity seen adequate to meet demand

Hostilities in Europe, if prolonged, are likely to have a profound effect upon utility operations and cost of contemplated expansion of plant facilities. The sharp rise in basic materials, especially metals, will mean higher prices for wire and cable and electrical equipment.

At present there is only speculation as to how far equipment prices might rise and to what extent such advances will retard proposed extensions of plant facilities. Wire prices are bound to reflect the demand for copper, and foreign demand will tend to push metal prices still higher. Utility executives are considering this situation in planning construction budgets.

Washington government agencies have plans to co-ordinate all private and public utilities to meet any emergency or possible power shortages in industrial areas. The National Power Committee, under Col. Louis A. Johnson, Assistant Secretary of War, has full information regarding the power needs of the country and where interconnections are needed to tie in the different utility systems to an adequate power supply. The Federal Power Commission has also made studies regarding the power situation and is prepared to act in any emergency. The Securities and Exchange Commission is ready to lend assistance to the utilities to meet any problems.

Early this fall the SEC expects to be in readiness to take up integration plans and simplification of corporate structures with the utilities. Action will be taken to put corporate structures in such shape as to allow the utilities to raise additional capital for plant expansion. One of the first problems to be tackled will be arrears on preferred stocks. It is contemplated that integration plans of several systems will be taken up at one time, rather than consideration of proposals of individual systems alone. In this way the disposition or purchase of isolated properties, to meet the geographic provision of the utility act, can be settled more satisfactorily and obviate the necessity of singling out one company as the first which would serve as a guide when other plans are considered by the SEC.

It was pointed out in government circles that should the utilities experience any undue difficulty in securing funds for plant expansion the RFC could be made an available source.

While utilities estimate that present, and contemplated, generating capacity is sufficient to meet increased power demands from industry in case of emergency, some action is being taken to advance orders ahead of schedule to insure delivery and to hedge against rising labor and materials costs.

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New Jersey Utilities Ask Rehearing on FPC Ruling

New Jersey Power & Light Co. and Jersey Central Power & Light Co. have asked the Federal Power Commission to reconsider its precedent-setting decision that Jersey Central is in interstate commerce because its lines are connected to those of Public Service

MODERN KITCHEN—Dr. George W. Allison of the Modern Kitchen Bureau speaking at a dinner given by Appalachian Electric Power Co. to 150 electrical appliance dealers, salesmen, contractors and home economists in the utility's territory

Electric & Gas Co., which sells power interstate to Staten Island Edison Co.

Briefs submitted by the two New Jersey companies contend that although Jersey Central sells electricity to Public Service, this is an entirely separate transaction from Public Service's interstate operations. They deny that consumption of Jersey Central energy by Staten Island Edison "is a matter of ordinary or usual course or . . . is of other than strictly academic and scientific interest."

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Washington Utility To Build Farm Lines

Construction of from 1,000 to 2,000 miles of rural lines in the next two or three years is planned by the Washington Water Power Co., according to Kinsey M. Robinson, president. This program carries out a new rural extension policy to bring electricity to thousands of Inland Empire farmers through a $1,000,000 dollar extension program financed by a $1,500,000 surplus from the company's recent $22,000,000 refunding operation.

Under the new policy, which does not conflict with the plans of the REA, Washington Water Power will build up to 2,400 ft. of line for a farm customer who agrees to pay a monthly minimum of $3 for electric service for the first five years, after which the regular minimum will apply.

The cost of building lines further than 2,400 ft. will be paid in five annual installments, but if the customer makes "normal" use of the service this money will be refunded on the basis of his electric bill.

According to Mr. Robinson, high-strength composite copper and steel conductors permitting ten or less poles per mile will be used, compared with 20 poles per mile for copper wire. Such modern materials and methods permit low cost construction of these lines.

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Fight Condemnation Action

Omak Chamber of Commerce, Omak, Wash., vigorously opposed the action of the county power district commission to prepare condemnation proceedings against the Washington Water Power Co. in a public resolution. The group asks that the question either be submitted to an advisory vote of the people of the county or that at least a public hearing be held on the matter before condemnation is undertaken, to give all taxpayers who desire an opportunity to be heard.

British Utilities Ready to Meet War Conditions

Systems expanded during past year to fulfill additional requirements, Davis M. DeBard reports upon return from abroad — Increased business activity followed recovery from war nerves last year

Returning from a trip to England, Sweden and Norway, Davis M. DeBard, vice-president of Stone & Webster Service Corp., states that the people of England are well prepared for hostilities. He said that in September, 1938, the people got over their case of war nerves and that the manufacturers, utilities and business in general set about for extensive preparations. Increased business activity followed.

During the past year the electric grid system and facilities of private utilities have been strengthened and expanded to meet any additional demand for power. The systems have been sectionalized so that if one section goes out of commission, due to air raids, the remainder of the system will function efficiently and the breakdown can be quickly repaired. Stores of spare parts and equipment have been organized to meet any needed repairs. New generating capacity has been added.

Mr. DeBard said that the manufacturers and utilities have constructed underground shelters — dugouts — for protection from air raids. He said that additional airports have been built as a measure of defense. Power output is up 20 per cent over 1938, with the trend toward higher levels, and there appears to be no shortage of power.

The British have eliminated the eleven different cycles in their utility systems by standardizing power at 50 cycles and 230 volts for secondary power for stores and residences. He said that the use of 230 volts effected a saving on wiring. He found that there is increased use of the 1½-gal. non-pressure electric water heater. Sales of electric cookers are also higher. Increased popularity was found for the enamel cooker without heat control. It is an all-inclosed unit selling on a five-year term basis. In West Ham, a suburb of London, more than 7,500 non-pressure 2-gal. type water heaters were sold in the last two years.

Because of the cool weather, Mr. DeBard said, sales of refrigerators are low.

Extensive use is being made of electric wash boilers. Many use them for heating bath water.

While factories and stores have good lighting, home lighting is backward, Mr. DeBard said. "The country needs our IES lamps."

It was found that even with England's low rates the average domestic use of electricity is below that in the United States. "England needs more of American advertising and promotional methods to increase use of electricity," Mr. DeBard said.

In Oslo, Mr. DeBard said, a start is being made on electric house heating. He said that 1,000 homes will be fitted as an experiment.

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Employees to Fight Proposed City Plant

Employees of Kansas Electric Power Co., Parsons, Kan., have formed an organization among themselves in an effort to save their jobs, contending that possibly all of them will be discharged if a proposal to vote a $450,000 bond issue for a municipal plant is successful.

One section of a resolution signed by 35 of the K.E.P. employees states that "we protest the efforts of a few persons to mortgage the homes of the city of Parsons through a $450,000 bond issue for the sole purpose of turning our jobs over to inexperienced politicians in the hope that 20 or 30 years from now the city may benefit by municipal ownership."

The employees are out to obtain an expression of the people on the municipal ownership question. The utility has offered a $33,000 rate cut for franchise renewal, which is under consideration by city commissioners.

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Cahokia Valuation Up

St. Clair County Board of Assessors has increased the valuation of the Union Electric Co. of Missouri's Cahokia generating plant by $2,168,180. Total valuation of the plant for 1940 taxation purposes was placed at $6,664,765. Last year's valuation was $4,496,585. Valuations set by the Board of Assessors are subject to approval by the County Board of Review, which for the past several years has scaled down valuations set on the Union Electric's plant.

Appliance Sales Soar in Mississippi Drive

Slash in electric rates is followed by cheap electricity campaign with Mississippi Power & Light contacting 43,000 customers to build additional load—Dealers out for $31,500,000 market

Benefits of cheap electricity are being broadcast throughout Mississippi in a fashion which has caught the eye of the 43,000 customers of Mississippi Power & Light Co. to the extent that there is a boom in household electrical appliance sales.

With rates recently slashed to save customers $265,000 a year and the opportunity to use 8,000,000 kilowatt-hours additional cost, customers have lost little time in taking advantage of the offer. Electrical appliance dealers report sharp increases in sales and see the trend continuing for some time to come.

New Low Rates

As worked out by the utility rate experts, the new schedule brings surprisingly low rate levels of 3¾ cents, 3 cents, 2 cents and 1½ cents to all residential customers in over 300 communities in the state with a special 1-cent rate for electric water heating, Rex I. Brown, president, stated. The monthly minimum has been changed from 10 to 15 kw.-hr. under the terms of the new schedule.

The reduction followed the signing of contracts between the City of Memphis and TVA, wherein Mississippi Power & Light was able to purchase some surplus power from TVA. With the block of "dump" power available, the Mississippi utility launched a gigantic campaign and offered 36 electric roasters and 72 modern IES table and floor lamps as prizes divided into twelve separate contest periods for the best statement of fifty additional words or less: "I know that electricity is cheap because . . . "

Electric appliance dealers fell in line with the promotional efforts of the utility and are taking every advantage to speed sales. Reports from the field indicate that quota for both residential and commercial sales will be exceeded. One dealer reported more refrigerators sold in his territory during the first six months this year than were sold during the whole of 1938. Roaster, lamp, fan, radios, ranges and other appliances are moving into homes at an accelerated rate.

Contact 43,000 Customers

To be sure that every customer knows about the full benefits offered in the new low rates, the experienced sales staff of the utility is contacting each of the 43,000 customers. Dealers have been provided with promotional material which has snap and customer appeal. It tells the story of the benefits of cheap electricity and how to make best use of it through appliances. Last year dealers in the territory sold over 95 per cent of the appliance volume in the area and have the full backing of the utility to do even more business in the future.

The company states that the new campaign opens a new $31,500,000 appliance market and will require $5,300,000 of appliances alone to use the 8,000,000 free kilowatt hours. All the sales prospects are turned over to dealers by the utility, which has been an added inducement for dealers to join in the big "GO" drive.

The three-month sales contest closed August 31; preparations were under way to honor the 50 dealers securing the greatest percentage of sales during the three months, as compared with the same 1938 period. This contest has clicked, L. M. Taylor, sales promotion and advertising manager of Mississippi Power & Light, declared as he saw appliance sales mounting and new load added to his company's lines.

While the three-month drive has closed, opportunity is being taken by the company and the dealers in the territory to carry on the splendid work during the campaign. Dealers find that early ground work is bringing in new orders, so the push is still on for additional appliance sales, which mean additional load for the utility.

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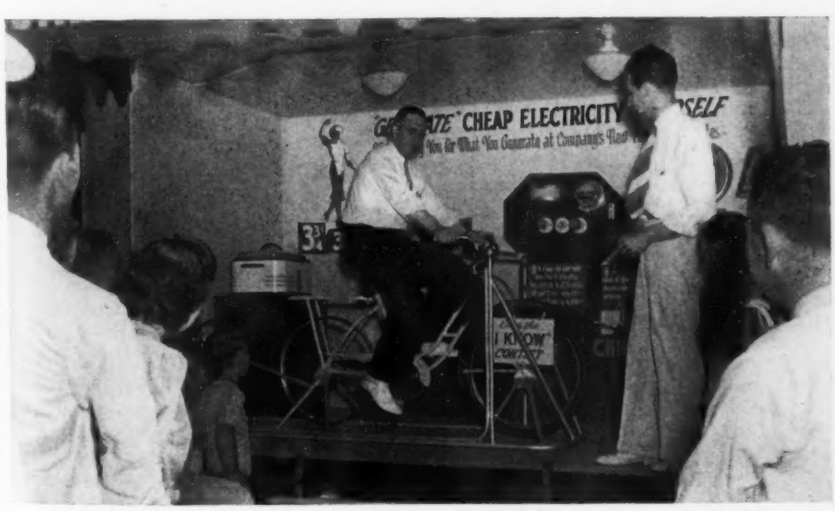
Finlay Joins J. G. White

Walter S. Finlay, Jr., for many years associated with American Water Works & Electric Co. as vice-president and director, and since 1927 president of its West Penn Electric Co., is resigning from these connections to join the J. G. White Engineering Corp. as vice-president.



CHEAP ELECTRICITY—Bob Smith measures the electricity generated by MP&L safety engineer Harold Garner (left), at a display where the company demonstrates cheap electricity. Les M. Taylor, MP&L sales promotion manager (right), assists Miss Edith Shackeroff of Batesville, "Miss Mississippi" at the 1939 Memphis Cotton Carnival, "down the rate"

Indiana Utility to Build New 50,000-Kw. Steam Unit

Contracts for generating unit to be signed about October 1 following regulatory approval of $6,400,000 financing and construction program—Substation and transmission line planned

Construction of a new 50,000-kw. steam electric generating unit at Dresser, Indiana, is to be undertaken by the Public Service Company of Indiana, according to R. A. Gallagher, president.

Mr. Gallagher stated that the new unit is to be constructed adjacent to, and operated in connection with, the company's electric generating plant at Dresser. The company is to build a 132,000-volt substation near New Castle, and a 132,000-volt transmission line approximately 41 miles in length extending from the new substation to approximately 9 miles east of the company's present Lenore substation, near Indianapolis.

Plant on Wabash

The Dresser plant is about seven miles south of Terre Haute, Indiana, on the Wabash River. The new unit is to be a 50,000-kw. turbo-generator; there are to be two 250,000-pound pulverized fuel boilers; pressure is to be 650 pounds; and temperature 900 deg. F.

It is expected that by October 1, the company will have obtained the necessary approvals of regulatory bodies for the proposed financing and construction of the project, Mr. Gallagher stated. The signing of contracts for the generating unit should follow shortly thereafter, he said, and it is expected that it will be ready for operation in about eighteen months.

The copper and steel towers have been ordered for the new transmission line, Mr. Gallagher stated. This line and the substation at New Castle are not directly related to the new plant, and construction should begin within the next two months, he said.

Estimated total cost of the new construction is $6,400,000. The Dresser Power Corp. will issue $1,600,000 of common capital stock and $4,800,000 of first mortgage bonds. The common stock will be issued to Public Service Company of Indiana for cash, the cash to be furnished out of working capital. The bonds, which are due serially over 18½ years, are payable $150,000 each six months beginning at the end of the third year, and bear interest at the rate of 3 per cent for the first year and 4 per cent thereafter. These bonds are under contracts now completed and are to be sold to insurance companies.

Public Service Co. of Indiana has filed with the SEC a registration statement covering $38,000,000 of 3¾ per cent first mortgage bonds, series A, due on September 1, 1969, and $10,000,000 of serial debentures due semi-annually on September 1, 1940 to 1949. Proceeds will be used essentially for refunding outstanding issues and $1,134,700 for the deposit in trust, prior to or concurrently with the delivery of the series A bonds and serial debentures, for payment of Indiana Power Co. first lien and general mortgage gold bonds, 7½ per cent series A, due November 1, 1941, and not redeemable.

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Florida Power & Light Plans $3,000,000 Unit

Florida Power & Light Co. will undertake a $3,000,000 expansion program at the Dania plant, according to Bryan C. Hanks, president. The capacity of the plant will be increased 50 per cent by the installation of a 25,000-kw. steam turbo-generator and auxiliary equipment. The transmission and distribution system will also be enlarged and revamped to handle the growth in load.

Designed to use fuel oil, the plant is supplied by boats which come from the Texas and Mexican fields in Port Everglades.

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Correction

In the August 26, 1939, issue of ELECTRICAL WORLD it was erroneously reported that the CNX cable provisions of the Article 300 committee were indorsed at the International Association of Electrical Inspectors meeting in San Francisco. The recommendation lost and the executive council regards it as turned down.

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Power Board Reconvenes

After a month of inactivity during August, members of the Federal Power Commission reconvened for their first hearing of the fall-winter term on September 5, facing a light power docket.

Hearings on a cost determination case involving the Niagara Falls Power Co. were started on that date. The only other important power case before the commission, aside from two dockets affecting the Niagara Falls Power Co., involves approval of the consolidation of the New England Power Co. and the Bellows Falls Hydro-Electric Corp. and certain facilities of the Connecticut River Power Co. A hearing on this case has been set for September 13.

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Puget Sound Plans Redemption of Bonds

Puget Sound Power & Light Co. has called for redemption on October 6, at par and accrued interest, all outstanding $2,919,500 of ten-year 5½ per cent coupon notes, dated February 1, 1930. Retirement is being effected out of cash on hand.

Consummation by the city of Seattle of its street railway refinancing program under a RFC loan enabled the company to proceed upon the note redemption at this time. The utility accepted $3,250,000 cash in full payment of principal and accrued interest for its remaining $8,336,000 transit system original purchase bonds. Cash received may be used for redemption of $3,195,000 outstanding Pacific Coast Power Co. first mortgage 5s which mature March 1, 1940.

Seattle received $10,200,000 from a RFC loan to clear up a 24-year-old debt burden. Puget Sound settled for $3,250,000 and the city and RFC disbursed $1,337,000 to warrant holders and paid $384,000 to holders of miscellaneous bonds. Owners of $400,000 more in warrants and extension bonds will not receive their money unless they accept the 20 per cent discount on securities to which all other creditors agreed.

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Completes New Line

Public Service Company of Oklahoma has recently completed and put into service 50 miles of 66-kv. wood-pole transmission line that provides a 66-kv. loop into Bartlesville from Tulsa. The line is of "H"-frame construction with an average span of about 700 ft. Structures are all X-braced. The line is in part constructed across irregular or hilly country (Osage Hills), where longer spans were used. The longest span was 2,500 ft. Conductor used was 266,800-circ.mil A.C.S.R.

Show High Efficiency of American Turbine

A $1,000,000 steam turbine with an efficiency 10 per cent below present levels would prove to be a money loser in operation even if the manufacturer gave it away free and the user had no original investment to take into consideration, R. S. Neblett, assistant manager of the turbine division, General Electric Co., told members of the Society of Mechanical Engineers at their recent meeting in Dallas, Tex.

Mr. Neblett said that a utility suffers an approximate loss of $1,000 a day when a 25,000-kw. turbine gets out of kilter. In addition it costs about $5,000 just to open up a turbine and find out what is wrong with it.

"Turbines manufactured in this country are much more efficient and compact then those produced abroad and as a result the American machines have a greater reliability," Mr. Neblett said. Using a chart based on reliability figures obtained from utility groups here and in Germany, he showed that the average G. E. turbine produced 40 per cent more kilowatt-hours than the average German machine of the same rating over a three-year period beginning in 1935.

The average 30,000-kw. station in 1918 needed $3,500 worth of coal daily for its operation, whereas today's average station of the same rating produces the same amount of power on a $1,450 ration. Mr. Neblett attributed a big share of this saving to a better understanding of metals and improved designs which have permitted the use of higher steam temperatures and pressures in turbines.

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$20,300,000 Issue for LCRA Approved

An issue of $20,300,000 bonds of the Lower Colorado River Authority has been approved by the State Attorney-General's Department, Austin, Tex. Included in the issue were $13,550,000 to retire former bonds sold by the authority to the PWA, with which construction of Buchanan, Roy Inks and Tom Miller dams has been financed; $5,000,000 for the purchase of Texas Power & Light Co. facilities and distribution systems in sixteen Texas counties and $2,000,000 for the construction of transmission lines and substations.

Contracts have been made by which the authority will take up the bonds previously sold the government and furnish an equivalent value of the new issue. The additional bonds will be sold to the government, as part of the general program of the CRA, under which $18,000,000 in grants and direct appropriations have been secured to supplement revenues from the bond sales.

DISPLAY ROOM—Cambridge (Mass.) Electric Light Co. modernized its display room at its Central Square offices with Litecontrol fixtures designed for 4.5 kw. each, using six lamps per fixture and prismatic lenses located above decorative pattern louvers. A pleasing effect was gained, together with high-intensity direct lighting (50 ft.-candles) of display merchandise

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Appoints Group to Probe Rates in New Mexico

Study of New Mexico utility rate structures, looking toward recommendations for regulatory legislation, will be undertaken soon by a committee appointed by Gov. John E. Miles. The group will co-operate with the Federal Power Commission.

Personnel of the committee includes State Corporation Commissioner Robert Valdez, chairman; J. R. Cole, Santa Fe utility official, and Nolan Walter, banker of Las Vegas. Regulatory authority over utilities in New Mexico is confined to municipal governments. Efforts to establish state regulation failed in the 1939 session of the Legislature.

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Speed Appliance Sales

Georgia Power Co. reports for the seven months ended July 20 total merchandise sales of $1,142,568, or 106.3 per cent of quota. Domestic sales totaled $649,086, all-employee small appliance sales $264,024 and commercial sales $229,457. Sale of small appliances was the high spot, reaching 170 per cent of quota to date.

Administration Firm on Power Provisions

Advocates of additional federal funds for work on rivers and harbors must recognize the right of the Federal Power Commission to determine whether proposed projects have electric power possibilities if they expect to get Presidential approval of their bill.

This was indicated when President Roosevelt withdrew his approval to H. R. 7411, which failed to contain the provision as contained in flood control authorization bills.

Since river and harbor projects involve such work as dredging, breakwater construction and at most low wicket dams for canalization of the Mississippi and Ohio rivers, official Washington is mystified as to the grounds of the President's objection. It was declared in some quarters that apparently it was feared that the government might miss a chance to generate some power in connection with harbor dredging and river work.

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Appeals Ruling on Plant

City of Columbus, Ohio, has filed notice that it intends to appeal a decision of the Court of Appeals on the $1,000,000 light plant extension to the Ohio Supreme Court. The Court of Appeals several months ago reversed a previous decision of Common Pleas Judge Charles A. Leach upholding the proposed $1,000,000 extension to the municipal light plant.

Program Announced by Electrochemists

The 76th meeting of the Electrochemical Society will be opened at the Hotel Commodore, New York, Monday morning, September 11, and will continue through Wednesday evening, September 13. The session Monday morning will be in charge of Prof. Hiram S. Lukens of the University of Pennsylvania and will be devoted to "Modern Methods in Electro Analysis." The Tuesday morning session on "Corrosion" is in charge of Dr. Robert B. Mears of the Aluminum Co. of America. The Wednesday morning session will cover electrochemical subjects of a general nature.

September 11 has been set aside by the New York World's Fair authorities as Electrochemical Day. The Acheson Medal and $1,000 prize will be bestowed upon Dr. Francis C. Frary, Aluminum Co. of America, at a dinner at the Hotel Commodore on September 12.

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Nebraska Power Set for Cookery Show

Nebraska Power Co., in co-operation with dealers, jobbers and the Modern Kitchen Bureau, will conduct a two-month electric cookery exposition through September and October in the company's downtown electric shop.

Electric cookery will be featured in dramatized demonstrations to show its efficiency and low-cost operations. Plans for the exposition call for the display of all standard makes of electric ranges.

Electric refrigerator sales in Nebraska during the first five months this year totaled 10,066, against 6,859 in the same 1938 period. Sales in Omaha for the first seven months totaled 4,058, against 4,122 in the 1938 period. Sales in July totaled 669 against 573.

Sales of other major appliances during the first seven months this year, as compared with the 1938 period include: ranges, 227 against 95; water heaters, 75 against 60, and washers 2,038, against 1,738.

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C.I.G.R.E. Paris Meeting

Engineers who are interested in the proceedings of the Conference Internationale des Grands Reseaux Electriques held recently in Paris should address their requirements to Tribot Laspiere, general secretary, 54 Avenue Marceau, Paris, France. Frederic Attwood, president of the American National Committee of C.I.G.R.E., states that the complete proceedings, including technical papers, detailed discussions and committee reports of the high-tension conference, will be available at the end of the year.

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City Votes Utility Tax

The Brownwood, Tex., City Council has adopted a 1 per cent gross receipts tax on electric, gas, telephone and telegraph utility companies.

MEETINGS

Electrochemical Society — Fall convention, Hotel Commodore, New York, N. Y., September 11-13. Dr. Colin G. Fink, secretary, Columbus University, New York, N. Y.

International Association of Electrical Inspectors —Western section, Hamilton, Ont., September 11-15; southern section, Asheville, N. C., September 18-22.

Wisconsin Utilities Association — Annual convention accounting section, Plankinton Hotel, Milwaukee, Wis., September 21-22; electric section, commercial and technical divisions, November 6-7, Schroeder Hotel, Milwaukee. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee, Wis.

National Industrial Advertising Association—National conference, Hotel New Yorker, New York, N. Y., September 20-22. William H. Easton, chairman, publicity committee, 420 Lexington Av., New York, N. Y.

Edison Electric Institute—Rural Sales conference, Electrified Farm, World's Fair., September 21-22; prime movers committee, Institute headquarters, 420 Lexington Av., New York, October 2-3; electrical equipment committee, New Ocean House, Swampscott, Mass., October 9-10; transmission and distribution committee, New Ocean House, Swampscott, October 10-11.

Association of Iron and Steel Engineers—Annual convention and exposition, William Penn Hotel, Pittsburgh, Pa., September 26-29. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

American Institute of Electrical Engineers—Great Lakes district, Minneapolis, Minn., September 27-29; Middle Eastern district, Scranton, Pa., October 11-13. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

Southeastern Electric Exchange—Engineering and operation section, Piedmont Hotel, Atlanta, Ga., September 28-29. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta.

Indiana Electric Association—Annual convention, French Lick, Ind., September 28-30. Tom C. Polk, secretary, 607 Traction Terminal Bldg. Indianapolis, Ind.

International Association of Electrical Leagues—Annual conference, Auditorium, Electrical and Gas Association of New York, Inc., New York, N. Y., October 4-6.

Public Utilities Association of West Virginia—Annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., October 6-7. A. Blis McCrum, secretary, 612 Charleston National Bank Bldg., Charleston, W. Va.

International Municipal Signal Association—Annual meeting, Providence-Biltmore Hotel, Providence, R. I., October 9-12. Irvin Schulsinger, secretary, 7 East 42 St., New York, N. Y.

National Electrical Contractors Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., October 9-12. L. W. Davis, general manager, 420 Lexington Av., New York, N. Y.

National Electric Wholesalers Association—Semi-annual convention, Hotel Gibson, Cincinnati, Ohio, October 16-20. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Safety Congress and Exposition—Atlantic City, N. J., October 16-20.

Empire State Gas & Electric Association—Annual convention, Westchester Country Club, Westchester, N. Y., October 19-20. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

National Electrical Manufacturers Association — Annual meeting, Palmer House, Chicago, Ill., October 23-27. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Southeastern Electric Sales Group to Meet

Announcement has been made by R. B. Roberts, chairman of the sales section of the Southeastern Electric Exchange, that the section will hold the regular fall conference at the Henry Grady Hotel in Atlanta, Ga., November 2-4.

The conference on Thursday, November 2, will be devoted to group meetings comprising the work of the following committees: Merchandising, rural electrification, lighting, industrial power and advertising and sales promotion.

A general session will be held on November 3 and 4 which will contain much of interest to the sales executives of the industry and those closely allied with it.

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North Central Trade Show

Tentative dates have been set for the Electrical Trade Show and convention week sponsored by the North Central Associated Electrical Industries. It is planned to hold the 1940 exhibit and convention at the Ryan Hotel, St. Paul, Minn., February 12-15. This exhibit is held under the sponsorship of the North Central Electrical Manufacturers Club, one of the units comprising the North Central Associated Electrical Industries.

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Publishes Pamphlets

The American Management Association, New York, has published three pamphlets on "Public and Industrial Relations in Production,' "A Symposium on Unit Costs" and "Quality and Inventory Control." These pamphlets are based on actual management practices in effect in companies in virtually every industry and represent the leading thought in their respective fields.

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Adds New Sales Outlets

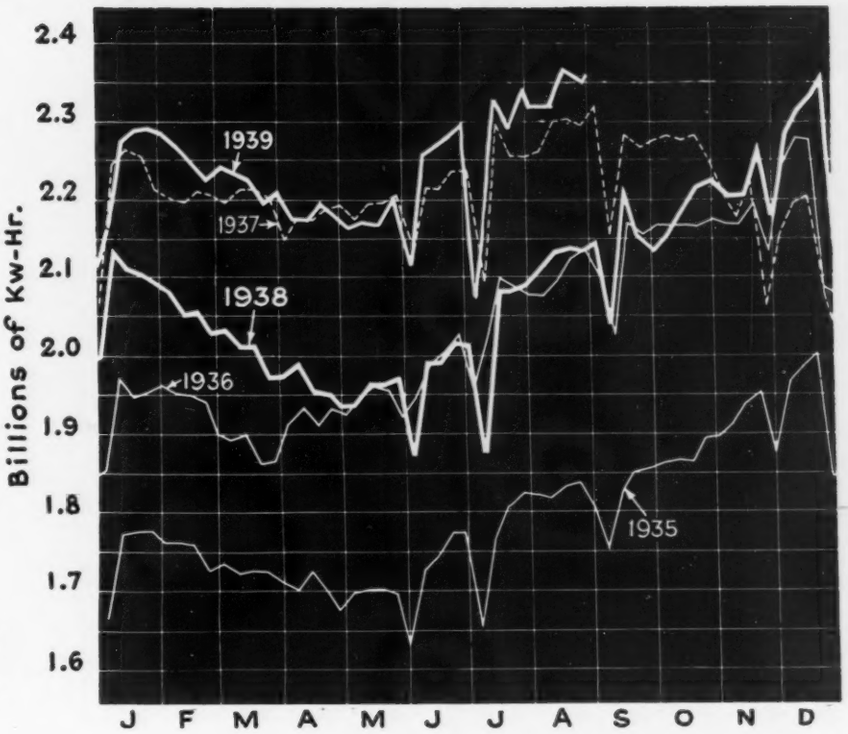
Eight of the leading department stores in the territory served by Consolidated Edison Co. of New York, Inc., have been accepted as participating co-operating department stores under the system's appliance promotion plan for the sale of standard gas and electric appliances, according to E. F. Jeffe, vice-president. The department stores will take part in dealer-utility co-operative merchandising and new business promotion and share in orders taken by sales department employees of the utility system.

Energy Production 9.7% Over 1938

Output of 2,357,203,000 kw.-hr. by the electric light and power industry during the week ended September 2, as reported by the Edison Electric Institute, indicates an almost negligible upward turn in the oscillating rise that has been in progress during the past few months. Because of a parallel but somewhat more pronounced rise in the corresponding period a year ago the margin over 1938 narrowed slightly, to 9.7 per cent, compared with the past two months, when gains were usually somewhat in excess of 10 per cent.

In 1937, also, there was a final rise at the beginning of September—the last one before the slump following Labor Day—which accounts for a shrinkage of the gain over that year to 1.5 per cent, as against 2.6 per cent a week ago. But these are minor changes; 1939 continues above all previous years.

Regionally, the Mountain area shows the highest rate of increase, nearly 20 per cent above 1938; the Central Industrial region is second, with 12.8 per cent, a little better than a week ago; of the two Eastern sections, with 11.6 per cent each, New England's gain is a little less than in recent weeks, the Middle Atlantic's is little more.



Weekly Output, Millions Kw.-Hr.

1939	1938	1937
Sept. 2...2,357	Sept. 3...2,149	Sept. 4...2,321
Aug. 26...2,355	Aug. 27...2,134	Aug. 28...2,295
Aug. 19...2,368	Aug. 20...2,139	Aug. 21...2,304
Aug. 12...2,333	Aug. 13...2,134	Aug. 14...2,301
Aug. 5...2,325	Aug. 6...2,116	Aug. 7...2,262
July 29...2,342	July 30...2,094	July 31...2,256

Per Cent Change from Previous Year

	Week Ending		
	Sept. 2	Aug. 26	Aug. 19
New England	+11.6	+12.9	+11.6
Middle Atlantic	+11.6	+13.2	+12.4
Central Industrial	+12.8	+12.3	+12.9
West Central	+ 5.1	— 0.3	+ 3.6
Southern States	+ 1.2	+ 4.0	+ 7.1
Rocky Mountain	+19.6	+16.4	+16.2
Pacific	+ 8.8	+10.6	+10.0
United States	+ 9.7	+10.3	+10.7

June Sales Up 15.3% Revenue Rises 6.8%

Sales of energy to ultimate consumers during June were 15.3 per cent larger this year than in 1938, amounting to 8,577,121,000 kw.-hr., as against 7,436,930,000 kw.-hr., and the corresponding revenue was $184,231,200, or 6.9 per cent more than the $172,319,600 (revised) a year ago, according to the Edison Electric Institute. Revenue from other sources added $1,934,800, which was 0.9 per cent less than in 1938, making a total of $186,166,000, as against $174,271,000. In June, 1937, sales were 8,261,200,000 kw.-hr. and revenue from consumers was $175,796,900.

Classification of Sales, June, and Increase Over 1938

Class	Thous. Kw.-Hr.	Per Cent
Residential, domestic	1,626,739	+9.4
Retail light, power	1,635,266	+12.2
Wholesale light, power	4,533,615	+21.7
Public lighting	111,031	+3.8
Other pub. authorities	194,368	—8.0
Electric railways	296,667	—2.2
Electrified railroads	144,248	+30.6
Interdepartmental	35,187	+4.4
Sales, ult. consumers	8,577,121	+15.3

The most important gain, 21.7 per cent, came in the wholesale group, which accounted for 53 per cent of the month's total sales to consumers, although a larger proportionate increase, 30.6 per cent, was registered by electrified steam railroads.

Production increased 13.8 per cent to 9,931,590,000 kw.-hr., the entire increment being carried by fuel-burning plants, which generated 6,510,603,000 kw.-hr., up 23.1 per cent. Hydro production was 3,420,987,000 kw.-hr., down 0.4 per cent and constituting only 34.2 per cent of the total, compared with 38.8 per cent in May, reported in the issue of August 19, page 9. Purchase of 409,971,000 kw.-hr. brought the total input to 10,341,561,000 kw.-hr., up 13.4 per cent.

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Refrigerator Drive

Because of continued interest on the part of dealers and electric utilities in the Modern Kitchen Bureau's "Scotch Eskimo" campaign for electric refrigerators, the drive will continue for the remainder of the year. Since January 1 more than fifty utilities have achieved highly gratifying results from the program.

Texas Power & Light Sets Lost-Time Accident Record

One year with no lost-time accidents in its nine generating plants is the record completed on July 22 by the production department of Texas Power & Light Co., according to John W. Carpenter, president. The record was made by a daily average personnel of 275. The aggregate is more than 570,000 hours.

Edward T. Keck, vice-president, is in charge of engineering and power, Norman G. Hardy is superintendent of power and Carl J. Rutland is director of safety for the company.

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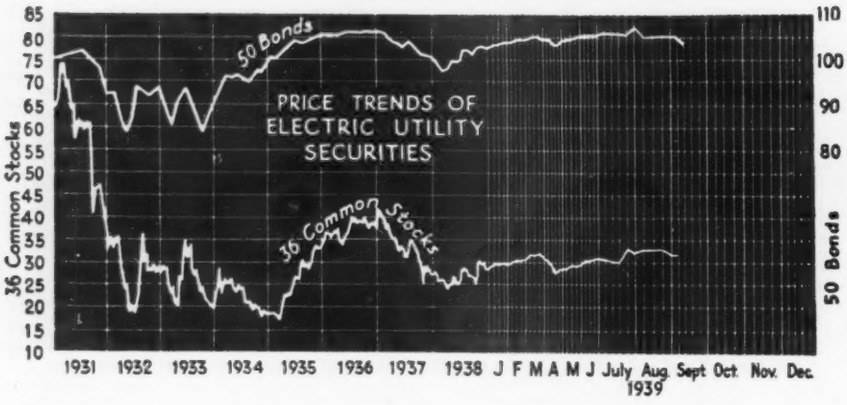
Pole Top Resuscitation

"Pole top resuscitation," the novel method of giving artificial respiration to an electrically shocked lineman without bringing him to the ground, is being taught to linemen of the Georgia Power Co. by Frank Hartman and Ed Rebel, Pittsburgh linemen, and W. T. Hawkins, safety engineer of Duquesne Light Co. The method was originated by E. W. Osterreich in Pennsylvania.

Utility Stocks Lower; Bonds Dip


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
50 Bonds
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec. 1939

The war buying wave which sent stock prices soaring caused few substantial changes in the utility list. "Electrical World" index, 30.6, as compared with 31.3 last week and 27.0 last year. Bonds dropped to 103.5 from 105.4 last week

Colorado Utility Files New Issues

Public Service Co. of Colorado has filed with the SEC a registration statement covering $40,000,000 of first mortgage 3½ per cent bonds, due 1964, and $12,500,000 principal amount of 4 per cent sinking fund debentures, due 1949. Halsey, Stuart & Co., Inc., Chicago, is listed as the principal underwriter.

Simultaneously, the SEC released its findings and opinion on the application of Halsey, Stuart & Co. for a determination of its status under the holding company act as "a possible and prospective underwriter." The commission approved Halsey, Stuart & Co.'s application to act as an underwriter.

According to the registration statement, net proceeds from the sale of the $52,500,000 principal amount of bonds and debentures, together with net proceeds from the sale at par to Cities Service Power & Light Co. of $2,190,000 par value of common stock, are to be used for refunding of outstanding bonds, for the payment of notes, for the payment of interest overlap and the remainder will be added to working capital.

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Utility Files Petition To Refund Preferred

Application has been filed with the Wisconsin Public Service Commission by the Wisconsin-Michigan Power Co. for permission to refund its outstanding 6 per cent preferred stock with 4½ per cent shares. Permission is asked to issue $4,000,000 of the new preferred to replace the 37,343 shares of outstanding stock. In addition the utility asks permission to issue $10,000 of promissory notes to provide additional funds in the refinancing program. It is proposed to call in the preferred stock at $110, plus dividends, on about November 15.

•

Eastern Shore Plan For Refinancing Filed

Eastern Shore Public Service Co. of Delaware and three Maryland public utility companies which it owns, have asked the Maryland Public Service Commission for approval of $3,981,500 of refunding bonds. This financial operation would mean $68,435 saving a year in interest to the company.

In addition, bonds for $600,000 will be applied to the $1,069,000 cost of a new power generating plant at Vienna, Md. Another $136,000 will be used to reimburse the Maryland Light & Power Co. for additions it already has made to its system.

•

Utility Seeks to Merge With Two Subsidiaries

Seeking authorization to merge its electric facilities with those of two wholly-owned subsidiaries, Pennsylvania Water & Power Co. has filed an application with the Federal Power Commission. The subsidiaries involved, Susquehanna Transmission Co. of Pennsylvania and Pennsylvania Transmission Co., had previously sought permission to sell their facilities to the parent company in applications filed last month, and the present applications are made pursuant to provisions of the Federal Power Act, which requires both parties to such transactions to secure commission authorization.

Both transactions have already been approved by the Pennsylvania State Commission.

Exchange Offer Made By New York Power

New York Power & Light Corp., a subsidiary in the Niagara Hudson Power Corp. System, has notified holders of its $66,000,000 of first mortgage 4½ per cent bonds due in 1967 of its offer to exchange these obligations of a like amount of new first mortgage 3⅜ per cent bonds due in 1969.

The offer will terminate at the close of business on September 20 and is conditional upon the deposit for exchange of at least $22,582,000 of the 4½ per cent bonds and upon the company's completing arrangements for obtaining additional funds, if necessary, for the redemption of its undeposited 4½ per cent bonds and $269,000 of Port Henry Light, Heat & Power first mortgage 5 per cent bonds, and for payment of $313,000 of Troy Gas Co. first mortgage 5 per cent bonds. Upon the exchange becoming effective, holders of the 4½ per cent securities will receive the new 3⅜ per cent series with adjustment of interest.

In connection with the offer, Otto Snyder, president of New York Power & Light, said that commitments had been received from nine large insurance companies for the purchase at 106½ of a new issue, not to exceed $41,000,000 of 3½ per cent first mortgage bonds due in 1964. Proceeds from the sale of the 3½s will be applied to the redemption on or about Nov. 1 at 104¾ of all the unexchanged 4½ per cent bonds and for the payment for redemption of the two small underlying issues.

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Stock Transfer Permitted

Pennsylvania Public Utility Commission has approved the sale and transfer of 31,000 shares of capital stock of the Public Utility Engineering & Service Corp. by Duquesne Light Co., Equitable Gas Co. and Allegheny County Steam Heating Co., members of Standard Gas & Electric system, to Standard Gas.

Utility Reports

	Net Income 1939	1938
*Idaho Pwr.	$1,675,833	$1,603,276
*Montana Pwr. and subs.	2,947,976	2,455,181
†National Pwr. & Lt. and subs.	7,413,296	8,583,759
*Nebraska Pwr.	1,902,311	1,882,912
†Northern States Pwr. (Minn.) and subs.	6,978,742	6,944,981
*Ohio Edison	4,216,179	3,848,528
*Pacific Pwr. & Lt. and sub.	960,644	788,652
†Pennsylvania Pwr. & Lt.	7,660,145	7,724,018
†Standard G. & E. and subs.	2,949,142	2,207,646
*Texas Electric Service	1,125,051	1,214,482
*Texas Pwr. & Lt.	2,061,916	2,244,791
*Utah Pwr. & Lt. and subs.	1,601,873	1,401,028
*Washington Water Pwr. and sub.	2,853,873	2,346,685

*Twelve months ended July 31.
†Twelve months ended June 30.

OPERATING PRACTICES

Unique Rig Handles Traffic Shells Easily

By E. F. NUEZEL
Underground Department,
Cincinnati Gas & Electric Company

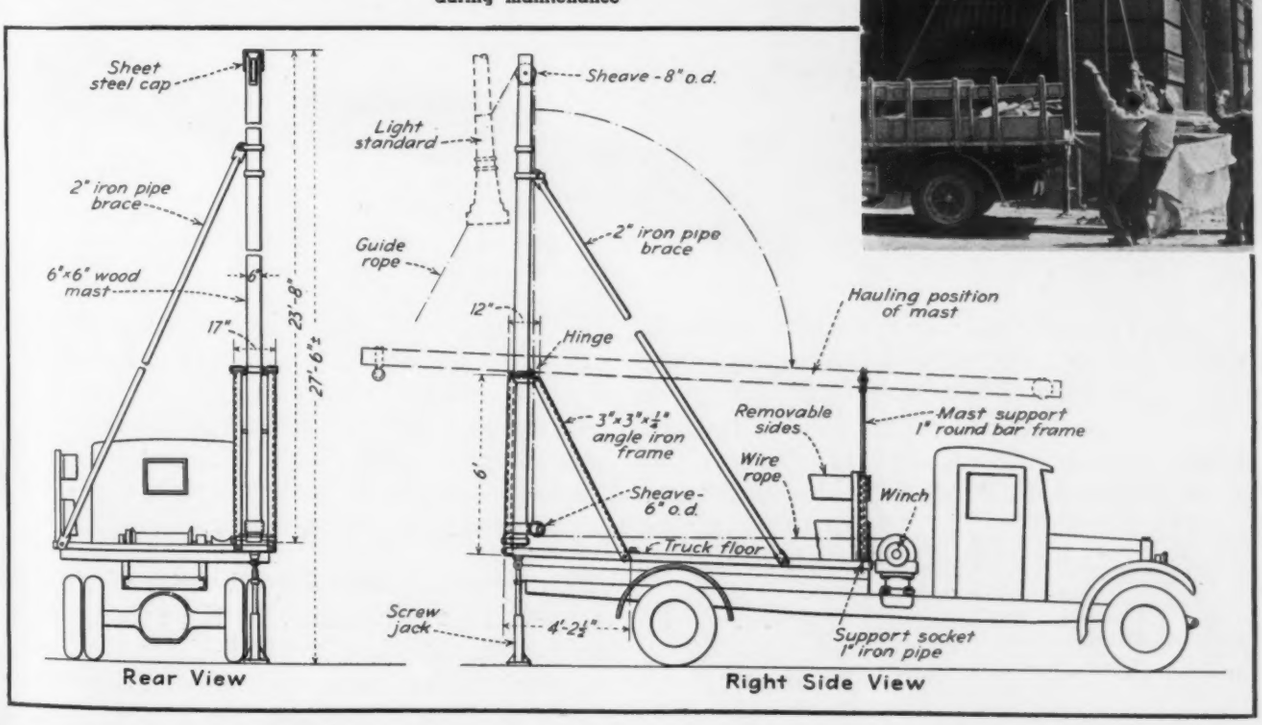
Big problem in the maintenance of traffic signal standards in Cincinnati until recently was the removal and replacing of a heavy ornamental iron shell surrounding the inner tubular steel pole concreted in the ground. The problem was solved by William Griggs of Cincinnati Gas & Electric Company with a boom-and-rope hoisting rig that clamps to the back of the truck and uses the truck winch to do the lifting.

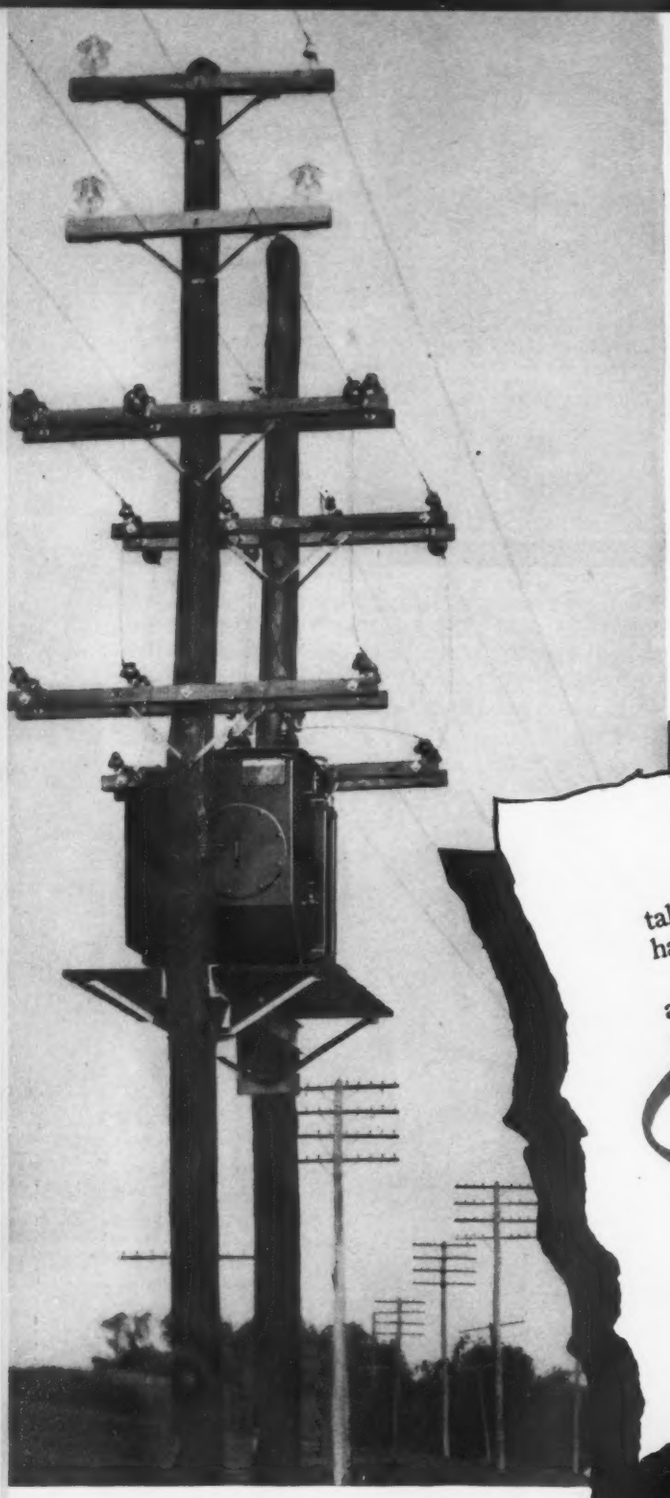
The rig, shown in operation, consists essentially of a 6 x 6-in. wood mast that can be mounted on the rear right corner of the truck in a very few minutes by bolting an angle-iron frame and supporting iron pipe braces to the truck body as shown in the accompanying illustration. A sheave at the top and bottom of the mast carries a steel wire rope from the power winch on the truck so that the standard can be very quickly raised or lowered over the steel inner pole.

It will be noted that the mast is hinged on the angle-iron frame so that it can be lowered to a support directly in back of the truck cab when not in use. The entire contrivance can be erected or dismantled from the truck within twenty minutes by removing bolts which fasten the angle-iron frame and pipe braces to the truck body.

A screw jack is inserted under the truck body directly beneath the mast to support the weight of the standard so that there is no rear spring deflection. The mast, therefore, remains in a true vertical position under load. This is particularly

Winch-powered detachable boom rig simplified handling of traffic signal standards during maintenance





7 years

G-E BUILT

taking of no corrective measures, which, of course, handicaps load development in that particular area.

A new type of voltage regulator recently brought out answers the need for a simple and low cost regulator applicable to rural lines and other places where improvement of voltage regulation at a low cost is needed. The first installation of this new type voltage regulator was made in September, 1932, on the Roanoke-Fincastle 6,900/12,000-"Y"-volt line of the Appalachian Electric Power Company near Roanoke, Va. The results were not only very gratifying from a functional standpoint but also from the cost angle, the total installed cost of the

ELECTRICAL WORLD—*May 20, 1933*

JUST seven years ago this month, General Electric provided the answer to the perplexing distribution problem of how to obtain economical voltage regulation for circuits of 6900 volts and above. The answer was a regulator that would match in economy at 6900 volts the induction voltage regulator, which had given for nearly 40 years (and still continues to give) such successful results on 2400- and 4800-volt feeders.

It was installed on a 6900-volt rural line in Virginia—a line with low load density and relatively low revenue per mile. Under these conditions it was essential to keep the investment as low as possible and limit the number of substations.

Like other rural lines, its development was piecemeal, one extension after another being added to the existing line until it was many miles long. So the problem was to provide—economically—good service where there would very naturally be excessive voltage drop. The answer to such a problem was *then*—as it often is *today*—the installation of a G-E step regulator.

This was the pioneering adventure in the field of step-voltage regulation. In the seven years since, this regulator has proved—over and over—its ability to do a good job inexpensively on circuits of 6900 volts and above. Its amazing utility has resulted in a wide variety of applications, which all provide one common benefit—***they're all paying their own way!***

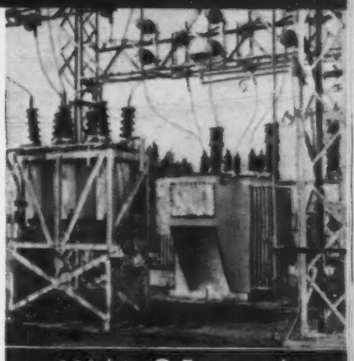
ago this month

THE FIRST STEP REGULATOR

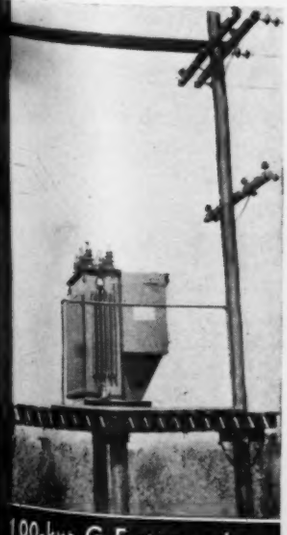
TODAY, HUNDREDS OF OPERATORS ARE USING THEM PROFITABLY

These G-E step-voltage regulators show the wide range of voltage and kva ratings of units giving economical and reliable voltage regulation over the entire country.

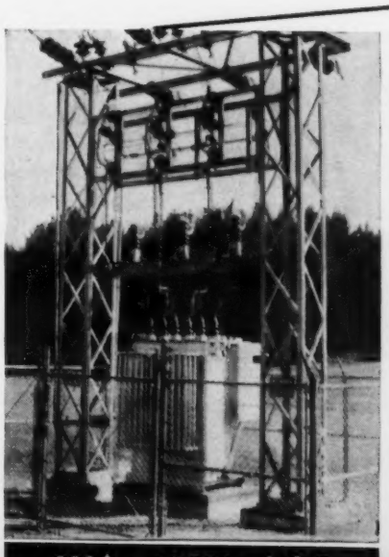
Each of these regulators, typical of hundreds of similar 3-phase G-E regulators, can be operated with 5/8 per cent steps.



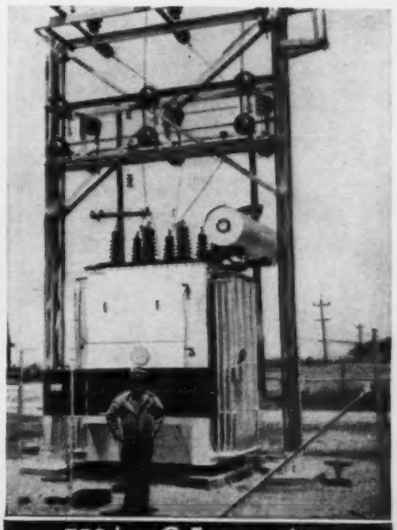
300-kva G-E step-voltage regulator, 34,500 volts, installed in the Southwest



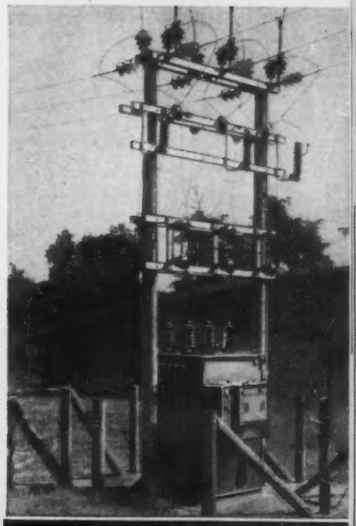
100-kva G-E step-voltage regulator, 11,500 volts, installed on the lines of a Southwestern power company



228-kva, 13,200-volt G-E unit serving a New England utility



750-kva G-E step-voltage regulator, 46,000 volts, serving an electric service company in the Southeast



400-kva, 41,500-volt G-E unit on the lines of a power company in the Northwest

GENERAL ELECTRIC

350-148

important where the mast has to be erected between other lines such as trolley feeders or other power circuits.

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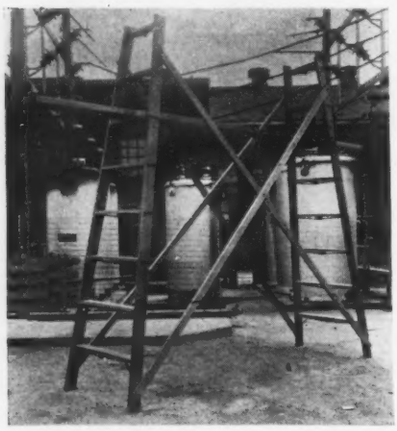
Safety Scaffold for Substation Work

By E. D. FREEMAN
Superintendent of the Transmission-Distribution Department, Oklahoma Gas & Electric Company, Oklahoma City

One of the greatest problems in substation maintenance and construction work has been that of providing a suitable platform of such design that work in practically any location can be carried on economically and safely. Our portable scaffold was



Flexibility of adjustment is a feature of this safety scaffold

Ladders may be placed from 6 ft. 8 in. to 14 ft. apart. Dismantled, the scaffold may be carried atop the body line truck.

designed primarily to eliminate the practice of working around energized equipment while standing on the steel structure.

The ladders for this scaffold are 14 ft. in length. The platform is a standard painter's and paperhanger's adjustable platform. This scaffold is made from straight grain spruce. The material is oven-dried and then cut to the proper dimensions and treated with an insulating preservative in the same manner as our ordinary hot tool equipment. It is unusual in its flexibility of adjustment. The two ladders may be placed at a minimum of 6 ft. 8 in. apart or a maximum of 14 ft. apart. Holes are drilled in both the ladder and diagonal braces, which permits assembling the ladders at any required angle or distance apart. The scaffold, when dismantled, is not cumbersome and may be carried on the ordinary slip-on body truck.

•

Spot Networks Avoid Investment

By A. G. JOHNSON*
Nebraska Power Company, Omaha

With the steady increase in air-conditioning load imposed on the 4-kv. substation serving Omaha's underground district the Nebraska Power Company was faced in 1937–1938 with incurring an immediate outlay of several hundred thousand dollars for additional substation capacity or finding some other alternative to meet the situation.

The problem was met by installing 13-kv. spot networks at locations in the underground district where load was being added most rapidly. To date four spot networks have been installed with a capacity of 6,800 kva. supplying a demand of 4,000 kva. in an area of five blocks. These installations are partially interconnected to smaller customers from secondaries connecting the installations. Additional spot networks will be put in to provide for new loads, keeping the 4-kv. substation fully loaded.

Transformers now being used are three phase, vault type, oil-filled, 13.75-kv. primary, 125/216-volt secondary, and have an impedance of 5 per cent. Three hundred-kva. and 500-kva. transformers are being used. By mounting network protectors and high-voltage grounding and disconnecting switches on the transformer tank a separate compartment for the interior protector and cable leads from the transformer to the protector is eliminated.

Motor-operated 1,200-amp. protectors are used on the 300-kva. transformers and 1,600-amp. protectors on the 500-kva. transformers.

During the past year we had 464 operations of sixteen protectors, of which about two-thirds were due to difference in voltage of the primary feeders. Only one failure of the protector to operate was experienced and this was due to a loose connection in the lead to the reclosing relay.

No new primary feeders have been required. Five of the existing primary feeders have been tapped for the necessary extensions to the transformer vaults. Three conductor No. 2/0 paper and lead cables are being used for the main extensions with No. 2 single-conductor cables extended to the transformers.

Two sets of four 500,000-circ.mil rubber-covered secondary cables are used. Where these cables extend through existing manholes one set is carried around on each side of the manhole. Services out of the manhole are divided between the two sets of cables. When a large service is taken out of the manhole the two sets of cables are bridged together. This arrangement has worked out very satisfactorily and is more economical than installing a bus in the manhole.

When the plans for the network were being studied the use of 350,000-circ.mil cables without fuses was considered. It was found that 500,000-circ.mil cables would be more economical to use, as less cable would be required, and in some cases new ducts would have to be provided if more than two sets of secondary cables were to be used.

*Adapted from a recent paper before underground systems committee, Missouri Valley Electric Association.

•

Fireproofing Cables

I—Low Voltage

By D. C. HAWLEY*
Kansas City Power & Light Company

In the system in Kansas City there is a special type of fireproofing in use for the low-voltage cables operating under 4,000 volts. It is not the idea that cables operating at a low voltage need less fireproofing than the higher voltage cables, but that the low-voltage cables are, for the most part, in congested manholes and are racked very closely together. The type of fireproofing used on the high-voltage cables could not be used because of the lack of space.

For cables operating under 4,000 volts an asbestos listing tape $\frac{1}{16}$ in. thick and 3 in. wide is used. The listing is soaked for about ten minutes in a solution of two parts water and one part asbestoment. It is then wrapped tightly on the cable spirally, half-lapping each turn. Over this a thin coat of asbestoment is applied with a

*Abstract of paper, Missouri Valley Electric Association, April 7, 1939.

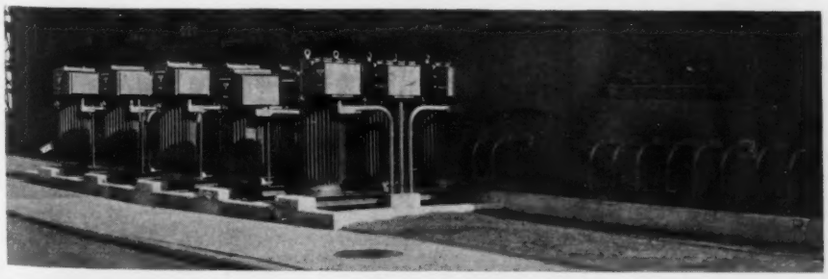
brush. This coating of asbestoment does nothing to improve the fireproofing qualities of the material, but is used principally as a water-resistant covering. It is found that there is practically no maintenance on this type of fireproofing. Cable can be moved and bent very easily without damaging it. This is particularly advantageous in a downtown system where splices have to be opened and taps made at frequent intervals. It is also found that this fireproofing can be removed, soaked and the excess asbestoment scraped off and used again. This type of fireproofing has proved very economical and satisfactory in every way.

•

Operating Advantages of Outdoor Regulators

Utilizing space available between its generating plant and a yard roadway, the Lynn Gas & Electric Company recently removed a bank of fifteen feeder regulators from inside the building to a site providing for symmetrical expansion of units and a reduction in fire hazard. Sets of three regulators each are mounted on 8-in. I-beams about 12 ft. long which span shallow bays surfaced with crushed stone for proper drainage. Kerite cable connections are made through 2.5-in. rigid conduit run below the surface and through the plant walls to bus compartments inside the building, rubber insulation without lead covering being used. Reinforced concrete ramp and bulkhead construction provide foundations for the regulator supports, and the layout allows for a further extension of 21 more regulators from left to right.

The usual current and potential transformers are located in waterproof housings on top of each regulator, but instruments and control are centralized at a special panelboard inside the station opposite the outdoor units. This enables repairs and calibration to be carried on in bad weather without outdoor exposure. Removal of oil from the building interior is advantageous from the fire hazard standpoint and the outdoor mounting improves ventilation.



Regulator layout at Lynn with space for expansion along unit lines

•

Analyze Transformer Insulation Faults

By E. W. WHITMER
American Gas & Electric Service Corporation, New York

In judging insulation faults by Doble power-factor tests we now feel prepared to analyze more thoroughly insulation faults by considering current as well as power-factor values.

In routine field tests it has been observed that most insulation which has an abnormally high power factor also has abnormally high current values. This phenomenon has been observed in several different types of apparatus in which the insulation is capable of absorbing moisture. However, high power factor oil in transformers does not appreciably increase current values, and this is best explained in that practically all oil we have tested has about the same dielectric constant as indicated by current values obtained from oil cell test.

Our experience in locating concentrated faults of any magnitude in transformers has to date been limited to those caused by defective bushings. Other types of concentrated faults, such as might be caused by a defective terminal board, have, in our experience, been exceedingly rare. Open-circuited windings have been located in some ten or twelve transformers, but these should, of course, not always be classed as insulation faults. From our testing and maintenance experience it seems that most of the highly concentrated faults in transformer windings are of a mechanical nature and therefore may not necessarily be indicated by a test of the insulation. The opinion formed as a result of our field tests is that moisture after its initial appearance in most transformer windings will, in a very few months, spread throughout the insulation rather than create a concentrated fault.

As a result of our experience in testing and maintaining transformers, and in the light of the foregoing data and discussion, the following conclusions can be drawn:

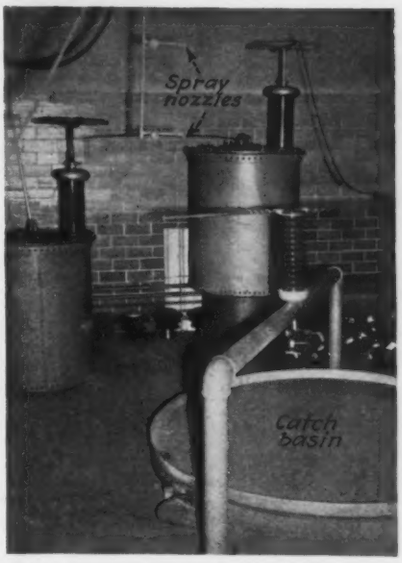
1. In testing transformer windings an increase in current values of some 10 per cent or more when accompanied by an appreciable increase in power factor (say an increase from 2 to 8 per cent) indicates the presence of moisture in the winding insulation.

2. An increase in winding power factor from some 2 per cent to say 5 per cent or more without an appreciable increase in current (less than 10 per cent) may indicate the presence of high power factor oil or a concentrated fault such as that caused by a bad bushing.

3. The development of highly concentrated faults in the main body of transformer windings is very infrequent. Such faults, when they do occur, are thought in most instances to be caused by mechanical failure rather than by any decrease in quality of insulating parts.

4. Current values have a decided significance in determining the nature of faults in insulation and, when determining the condition of transformer winding insulation, should be considered an important part of the power-factor test.

Check Flashover Values-Wet



High-voltage post-and-pin-type insulators being tested for flashover value wet in the high-voltage laboratories of Central Illinois Public Service Company, Springfield, are mounted on a pipe frame above a 10-ft. diameter catch basin. Spray nozzles suspended from the ceiling provide the "rain." The mounting frame is on casters and can be easily moved away from the catch basin if desired. In the background are the two 150-kv. test transformers which, when connected in cascade, provide 300 kv.

6 MONTHS AGO—

Our Announcement of Magne-Blast Breakers in Metal-Clad

TWO announcements within six months of two new G-E breakers which are of radically improved construction! This tells you something of the intensity of our recent efforts to provide you with a complete line of metal-enclosed switchgear using oilless breakers.

The trend toward the elimination of oil is unmistakable. Our engineers have welcomed it, putting their entire resources back of a program to develop a complete line of high-voltage breakers to operate in air. This has already been so successful that it promises to have a profound influence on the art of switchgear design and application.

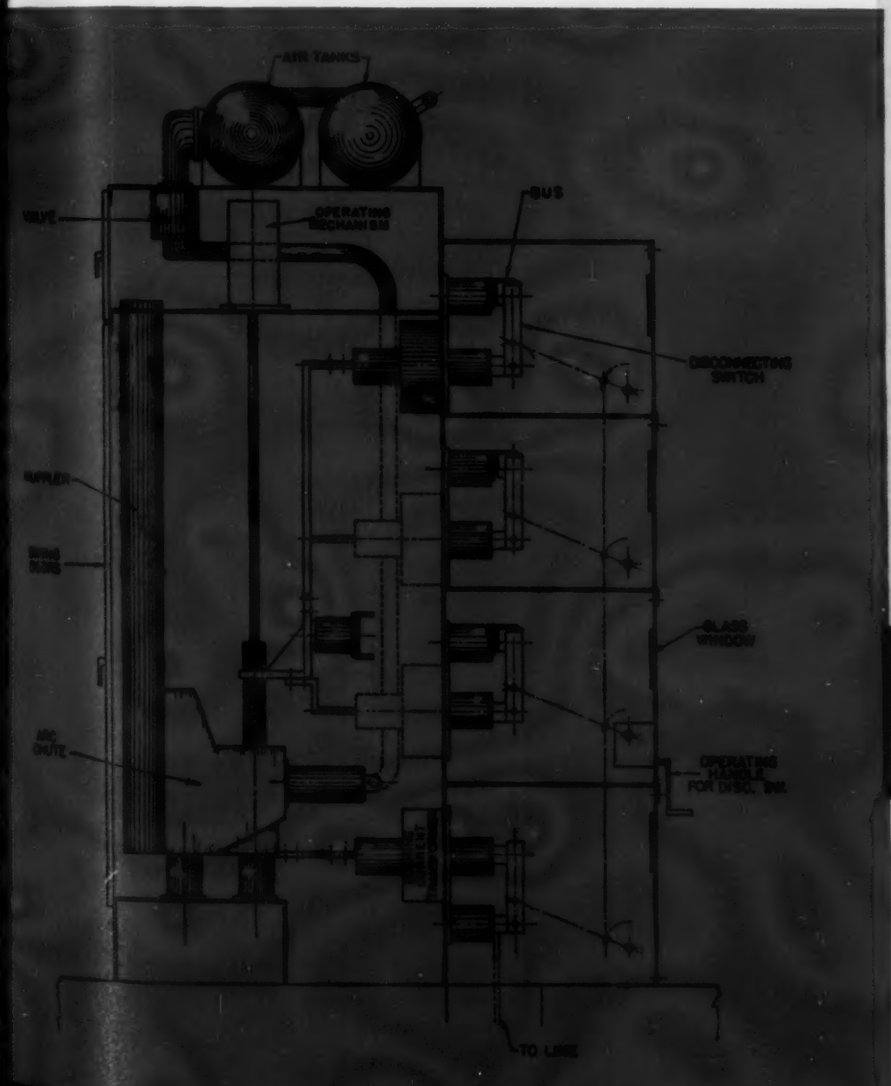
We've just issued a special illustrated booklet on these two new breakers. Ask your G-E switchgear representative for a copy. General Electric, Schenectady, N. Y.

Switch to Switchgear with Oilless Breakers

And NOW

Cubicles with Air-Blast Breakers

15,000 Volts, Up to 1,500,000-Kva Interrupting Rating



IN THIS new oilless breaker, compressed air is used to operate the breaker as well as to interrupt the circuit. This breaker is particularly well adapted to the G-E arrangement of cubicle switchgear. It permits the standard arrangement of buses, six isolating disconnecting switches, mechanical interlocks, current transformers, etc.—all shipped assembled as one unit.

GENERAL ELECTRIC

INDUSTRIAL ENGINEERING

Synchronous Motor for Air Conditioning

While wound rotor motors conventionally have been used for air-conditioning systems, there is a noticeable trend toward the synchronous type in the larger sizes.

At the International Building, Rockefeller Center, New York City, a 1,000-hp., 1,200-r.p.m., 100-per-cent-power-factor Westinghouse synchronous motor drives a 4,300-r.p.m. Carrier centrifugal compressor supplying 800 tons of air conditioning for the International, the Associated Press and the Time and Life buildings. It is said to be 1½ per cent more efficient and to cost about 10 per cent less than would a wound rotor type unit. In addition, the power-factor correction feature will take on added value when other contemplated units are added.

The largest-known synchronous motor supplied at this low voltage from city networks, this unit is direct-connected, through its associated control and the circuit breaker on the switchboard, to the secondary of two 1,000-kva., three-phase, 13,800/208-volt transformer banks interconnected in parallel in a subway vault. Distribution to the motor is three-wire; the primary of the transformer banks is fed from Consolidated Edison Company of New York, Inc., lines.

The motor is started without causing any noticeable flicker on the network system. Control is full-magnetic with three points of resistance; motor is brought up to full speed within 25 seconds, current inrush on the last step being about 8,000 amp. Full-load current is 2,160 amp.; with a locked rotor, a current of 9,500 amp. would be drawn were the unit thrown directly across the line. Motor is protected by a 2,500-amp. air circuit breaker.

An additional power-factor meter is used with the motor. This operates two contacts: At 95 per cent power factor one contact sounds a klaxon to attract the engineer's attention; if the condition persists, the second contact cuts off the motor when the power factor drops to 65 per cent.

Quietness of operation is another feature of this motor. Said to be the quietest yet designed for its power and speed, it tested about 83½ decibels, as compared with 62 for conversation, 72 for a typewriter. Clyde R. Place was the consulting engineer.

Westinghouse

Large synchronous motor used on city network for air-conditioning system
Auxiliary motor-generator set used for d.c. excitation of the 1,000-hp. synchronous unit is shown at the left; in the upper right of this view may be seen the busbar feed leading from the control. Main control panel for the unit is shown at the right.

•

Co-ordinated Controls Regulate Processing

Photo-electrically controlled weighing scales, electric timing relays and interlocked controls are so co-ordinated at the Batavia, Ill., plant of the Campana Corporation that human errors in the processing of complexion creams and lotions made by this company are almost entirely eliminated and control of ingredients within 1/50 of 1 per cent is said to be attained.

Merely to use photo-electric eye-controlled scales for weighing ingredients later conveyed to batch tanks in pipe lines or conveyors would not have provided this accuracy, since some of the ingredients would have been retained in the pipes. To avoid long pipe runs and promote flexibility, processing is centered around several turntables which bring batch tanks close to the scales, where the different ingredients can be discharged in sequence through short pipes immediately into the batch tanks from the scale.

Nerve center of this system is the

FRIENDLY METALS

Copper and iron, copper and zinc or other dissimilar metals in contact create galvanic couples particularly active in the presence of soil electrolyte. The copper-to-copper contact of a copper grounding wire clamped to a Copperweld ground rod with a Copperweld clamp assures friendly metals in contact under the ground.

NO ELECTROLYTIC CORROSION

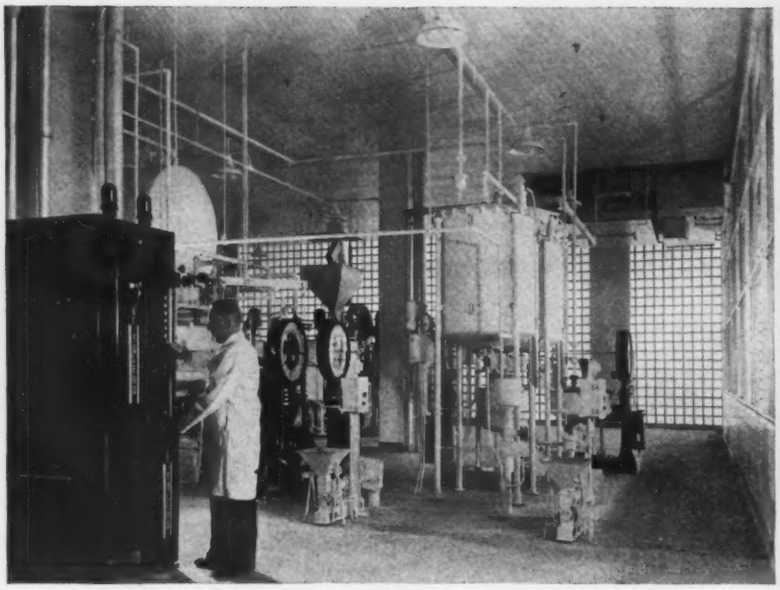
PERMANENTLY GOOD ELECTRICAL CONNECTIONS

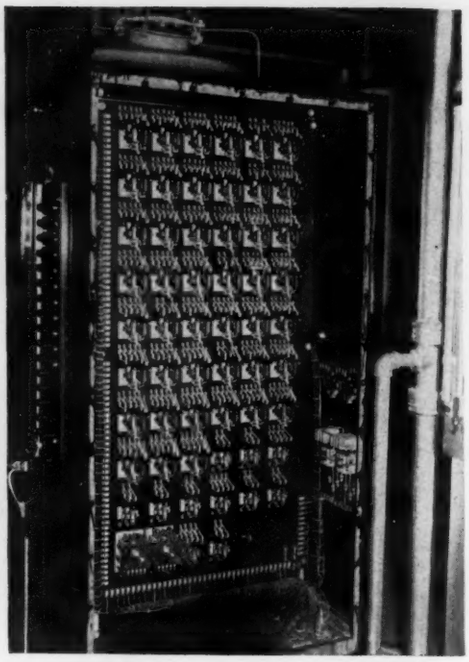
FOR DEPENDABLE GROUNDS AND DEPENDABLE CONNECTIONS

COPPERWELD

Non-Rusting **GROUND RODS** and **CLAMPS**

COPPERWELD STEEL CO GLASSPORT PA





Interlocked, timed sequence control automatically regulates complex processing of skin lotion

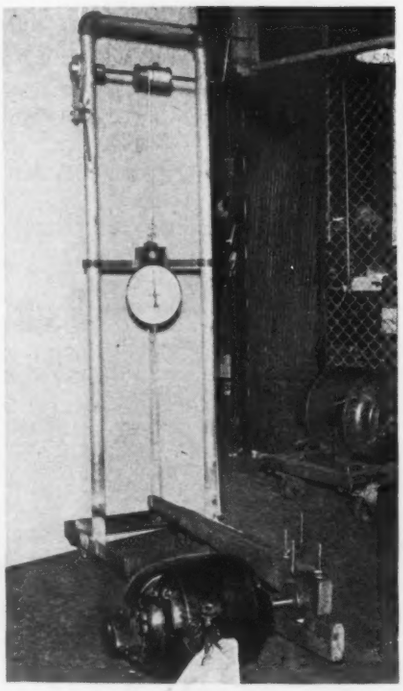
Left—Each button on the control board at left initiates a separate operation in the pre-mix processing, such as photo-electric weighing, agitating or pumping. Buttons must be pushed in order from top to bottom to complete a batching cycle. Right—Interior of process control board.

central control board. This board is so arranged that once a batching cycle is initiated the jobs of weighing and introducing ingredients, operating valves, agitating and discharging batches are performed automatically in proper sequence and for the correct length of time.

For example, in the pre-mix process department, where the high-priced essential oils, previously blended, are mixed with alcohol and other ingredients to make a concentrate of proper consistency, the central control board (in illustration) has two panels, one for each of two products. Only one bank can be operated at a time. To initiate operations, the operator depresses the top push button, and if valves have been properly set for processing that product a green light shows and the next button is depressed, starting the first operation of the batch cycle, whether it is weighing, agitating or valve-operating function. On its successful completion a second green light shows and the next button is depressed, and so on until the operator has depressed all the buttons in order from top to bottom, completing one batching cycle.

To protect against explosion of alcohol and other vapors, control process temperature and exclude dust, the pre-mix, as well as other process departments, are air conditioned, with air temperature held at 70 deg. and air changed six times an hour. The air-conditioning system is electrically interlocked with the processing equipment so that the electrical equipment in the process departments cannot be operated if the air-conditioning system is out. In addition to electrical interlocks, a damper is provided in the air suction system that is held open by air flow. If the flow is cut off by belt failure or other non-electrical cause the damper will drop, cutting off electrical equipment in the department concerned.

Torque Frame Speeds Rewound Motor Tests



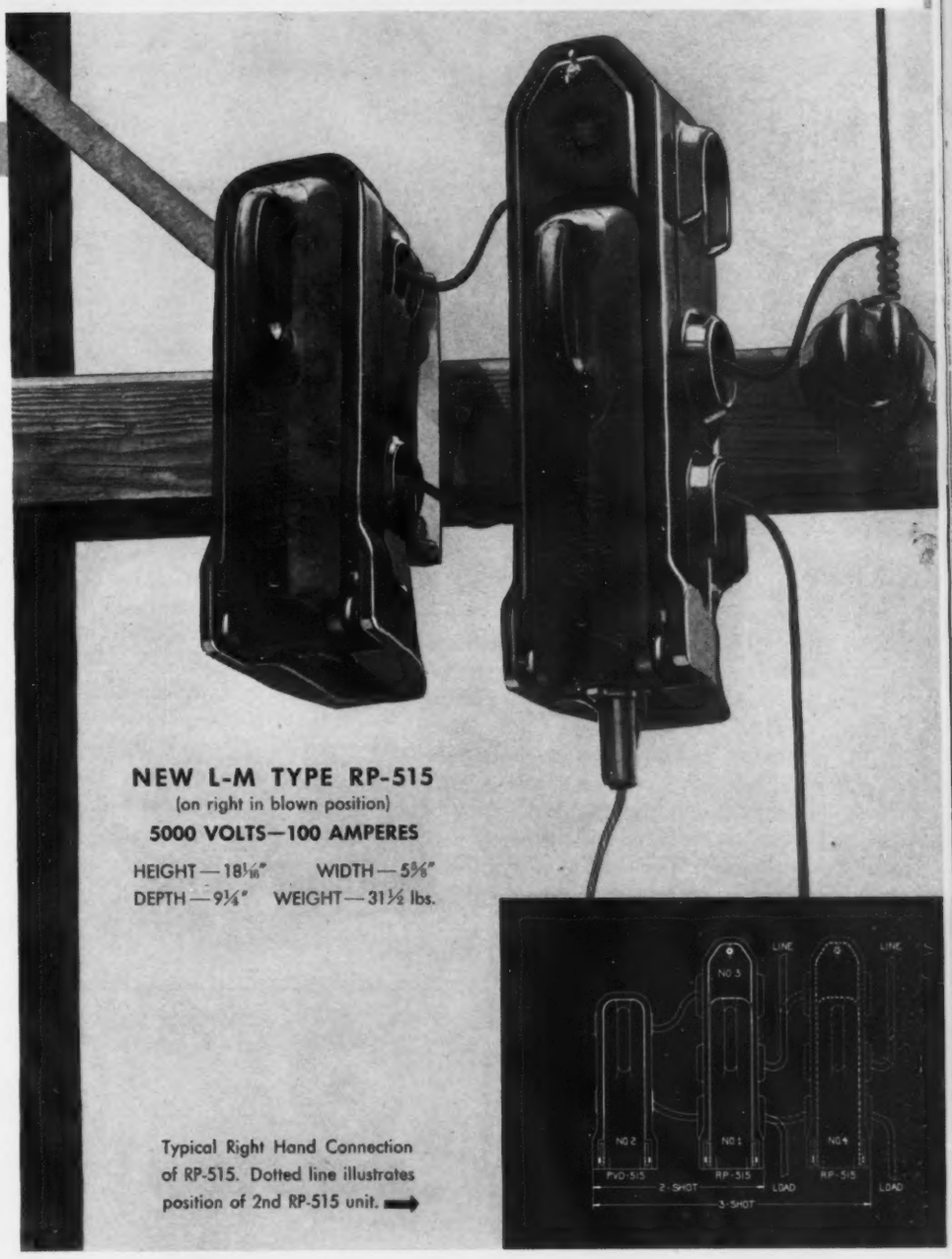
Torque frame speeds tests of motors rewound in utility shop for new frequency

An inexpensive, home-made testing frame devised in the motor winding shop of the Gary (Indiana) Heat, Light & Water Company makes it possible for operators to take a full set of torque readings on motors, rebuilt for the new system frequency, without changing their set-up and without lifting the motor from the floor. Its use has considerably speeded the mass testing of motors.

Ordinarily, the operator would have to make a change in the test set-up in order to take torque readings with the arm at 7.5 deg. below and 7.5 deg. above the horizontal. With the frame shown, however, all that is necessary is to wind up a small windlass and proceed with the next reading. A small brake on the windlass shaft holds it in any desired position. The scale for reading the torque is provided with guides that ride up and down the pipe frame as the position of the torque arm is changed.

The frame is of $1\frac{1}{2}$-in. pipe brazed to an angle iron-support equipped with casters to give the unit mobility.

FIRST 100 Ampere Cutout to Combine Automatic Reclosing with Porcelain Housed Weather Protection



NEW L-M TYPE RP-515
(on right in blown position)
5000 VOLTS—100 AMPERES
HEIGHT—18 1/16" WIDTH—5 5/8"
DEPTH—9 1/4" WEIGHT—31 1/2 lbs.

Typical Right Hand Connection of RP-515. Dotted line illustrates position of 2nd RP-515 unit. ➡

On any substation or at any distribution point where you now have only a single shot 100 ampere cutout... that's the spot to install the new L-M-RP-515. Just hook it up to the single shot cutout already in service and you have the *first* cutout to combine the trip-saving, outage-preventing features of the recloser plus the weather protection of porcelain housing.

OPERATES WITH ANY SINGLE SHOT CUTOUT

Type RP-515 operates as a reclosing cutout in conjunction with any standard 100 ampere single shot fuse cutout, either expulsion or dropout type. By using one RP-515 connected with a single shot cutout you get a two-shot recloser. By using two RP-515 cutouts connected with the single fuse cutout, you have a three-shot recloser. Thus, the new RP-515 offers unusual flexibility in that you can use as many fuse units as you wish in the reclosing sequence.

In addition, Type RP-515 has all the fully automatic features typical of L-M reclosing cutout design... where two or more units have operated they can be restored to service without regard to operating sequence. Clear dropout indication of blown position. Ask your L-M representative or write to South Milwaukee, Wisconsin for further information on this *new* L-M Cutout.

LINE MATERIAL CO.

NEW ENGINEERING IDEAS

Ljungstrom Turbine for English Station

Two 37,500-kw. Brush-Ljungstrom turbo-alternators recently put into service at the Southwick (England) generating station of the Brighton Corporation Electricity Supply are said to be the largest installed in that country.

As reported in *Engineering*, the turbine is centrally located in the turbo-alternator casing and consists of two interleaved disks, which rotate in opposite directions at 1,500 r.p.m. There are 57 rings of radial-flow blading and two axial-flow, single-rotation, low-pressure stages in each turbine. The central position of the turbine in the casing permits the double-flow arrangement to be used for the last stages. Disks are mounted on short hollow shafts which overhang the inner bearings and are in turn bolted to the ends of the main shafts, which carry the alternator rotors.

Due to the flexible construction of the blade system and to the absence of long members exposed to a large temperature gradient, the Ljungstrom turbine may be started without any preliminary warming up. At Brighton a quick-start ejector is used; it is said to be capable of raising a vacuum of 24 in. in three minutes. In addition, there are two three-stage ejectors with intermediate surface condensers.

Up to April 1 this year the second unit had generated 73,000,000 kw.-hr. in 3,016 running hours since its installation last November. On the official trials in December the steam consumption at a load of 30,000 kw. was 8.63 lb. per kw.-hr., when supplied with steam at 650 lb. per sq.in. and a temperature of 850 deg. F. Vacuum during the test was 29 in. and the steam consumption included all the quantities bled to raise the temperature of the condensate to 334 deg. F. This corresponds to a heat consumption of 9,759 B.t.u. per kw.-hr. or a thermal efficiency of 35 per cent, and it has enabled electricity to be generated at ordinary service conditions with less than 1 lb. of coal per kw.-hr.

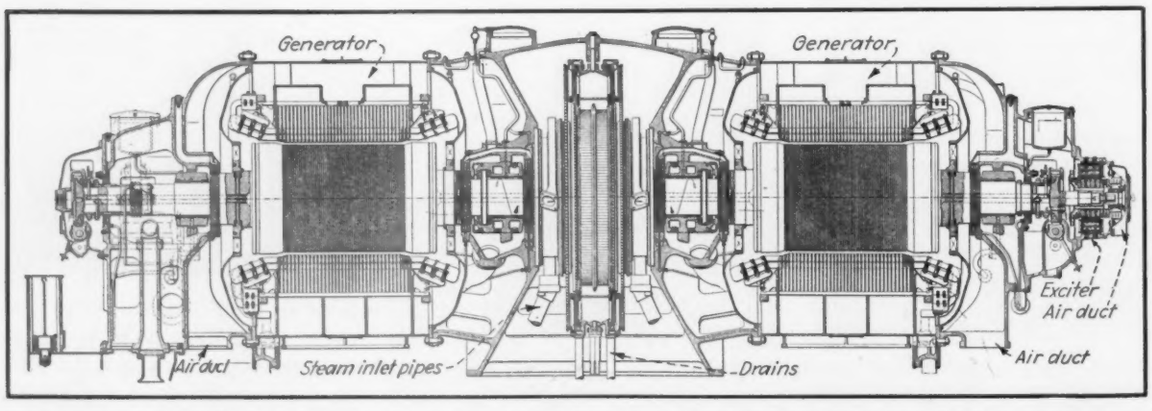
Units were built to the specification of W. N. C. Clinch, engineer and manager of the Brighton electricity department, by the Brush Electrical Engineering Company, Ltd., Loughborough.

•

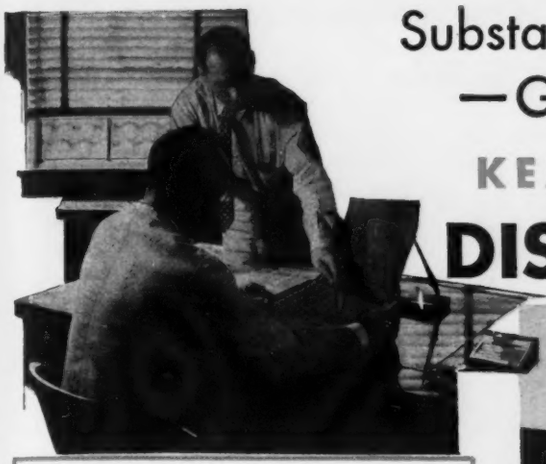
Measures Illumination of Diffuse Sources

Surface sources of low luminosity possess advantages for certain lighting requirements. In the computation of irradiation from diffuse surface sources the integrals involved often become difficult to evaluate or so lengthy that the numerical work is tedious. In a recent paper presented by Messrs. V. H. Cherry, D. D. Davis and L. M. K. Boelter before the Illuminating Engineering Society a mechanical integrator was described by which the shape factor might be measured for calculation of light from diffuse surface sources.

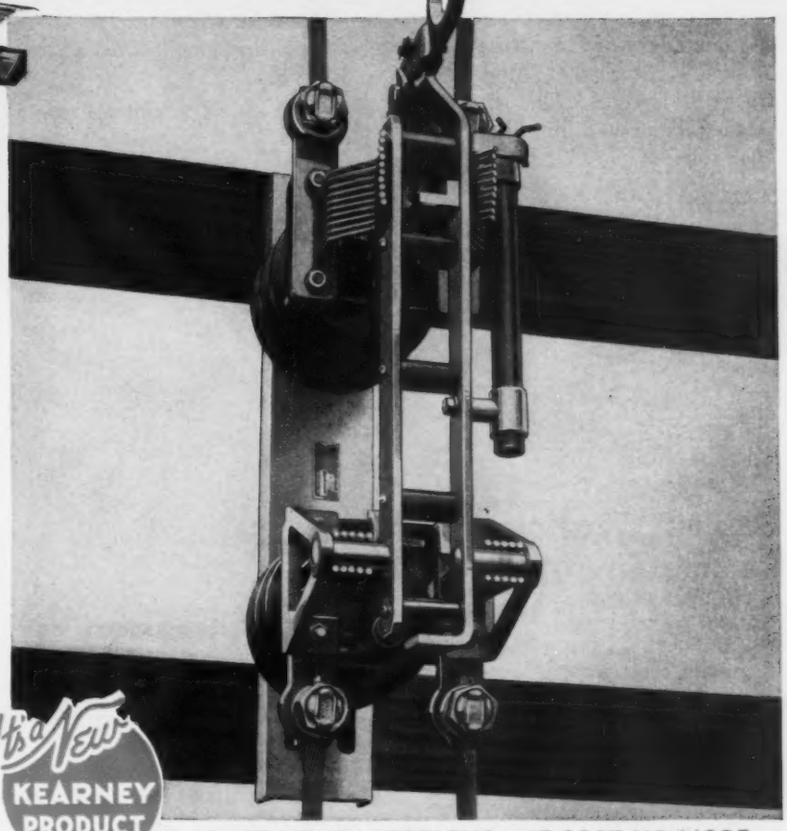
Essentially the integrator consists of a hollow beam attached at both ends to a circular frame. The frame is swung about a vertical axis by means of a ball bearing race about its outer edge. A tube containing the lens system for the projection of the image of an illuminated cross hair



Cross-sectional view of 37,500-kw. Brush-Ljungstrom turbo-alternator at Southwick station of the Brighton Corporation



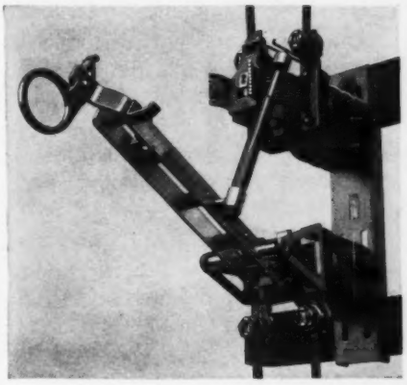
Substation Costs Should be Reduced —Good Reason To Specify New KEARNEY BY-PASS DISCONNECT SWITCH



IT SOLVES UTILITY PROBLEMS - IT COST NO MORE —

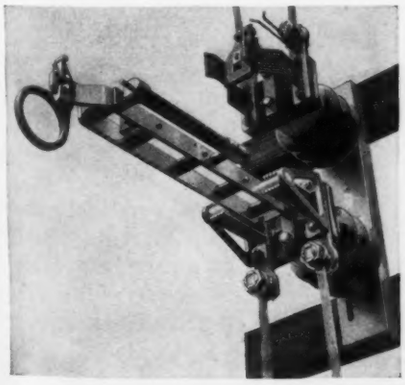
THE 1st ACTION....

The switch operates to by-pass and short-circuit the blades . . . next, blades are withdrawn from the multiple point-pressure contacts—then regulator exciting current is interrupted by auxiliary switch (on side of blade).



And Finally....

After the auxiliary switch has interrupted the regulator exciting current, it returns to normal position, the blades and auxiliary switch opening to 90 degrees, as illustrated in the photograph.



ELIMINATE COSTS of three conventional hook operated switches, and, perhaps, the cost of a manually operated circuit breaker, in connection with voltage regulator installations . . . Use just one (1) Kearney By-Pass Disconnect Switch—conserve space—economize in taking a regulator out of service for inspection or repairs.

Careful research combined with sound engineering design has made it possible to produce this Kearney By-Pass Disconnect Switch, with exclusive features that permit by-passing a regulator, and then disconnecting it—all in a single operation.

This switch is rated 7500-750 volt, 400 ampere . . . a new switch —the result of requests of operating men who learned how they could reduce costs with the smaller Kearney 7500-750 volt, 100 ampere By-Pass Switch.

Effect immediate savings in substation installations and obtain improved operation. Specify Kearney 7500-750 volt, 400 ampere By-Pass Disconnects on your next substation job . . . See why other operating men rely on just one of these switches to do the job of three conventional disconnects. It will pay you to investigate.

Write for Further Information.

MANUFACTURED BY

JAMES R. KEARNEY CORPORATION

4224-42 CLAYTON AVE.—ST. LOUIS, MO.

BUILDERS OF MODERN UTILITY EQUIPMENT FOR OVERHEAD AND UNDERGROUND CONSTRUCTION

upon the diffuse area is pivoted about the horizontal axis. Running inside of the beam is a wheeled carriage attached to a vertical rod running in a groove in the same beam. Sliding on the rod is a crosshead attached to the lens tube at a radius R from the horizontal axis. The crosshead moves in a hemisphere when the tube is moved in a manner such that the image of the cross hair passes along the outside boundary of the diffuse area and a pencil attached to the carriage traces the area A''. The shape factor is then computed by the following equation:

$$\text{Shape factor} = \frac{A''}{(\pi)\ (R)^2}$$

This instrument is useful in transfer problems, but (1) a model must be constructed, (2) an error of 4 or 5 per cent may be expected due to bearing tolerance, (3) the shape factor results may only be applied to surfaces which may be considered diffuse over the solid angle involved.

•

Ballistic Wattmeter for Arc Energy Study

A ballistic wattmeter proved a convenient and rapid means for measuring low-voltage arc energies in a recent investigation of the effect of speed of contact opening on arc energy in a.c. switching, according to the *General Electric Review*.

This instrument, which is of the light-beam type and is used in much the same way as any galvanometer, proved particularly useful since no synchronization with the measuring instrument—an oscillograph, for example—is required. Readings of energy are taken, when the circuit is broken, by noting the deflection of a light beam on a scale.

Two ranges are provided by the instrument, 0 to 10 watt-seconds and 0 to 20 watt-seconds; it is rated at 10 amp., 220 volts, and is a recent development of the general engineering laboratory of the General Electric Company. In the research mentioned readings were taken while interrupting a non-inductive, 60-cycle alternating current of 35 amp. at 115 volts.

With this instrument was used a special contact-speed-test apparatus, which was designed to provide uniform contact speeds over a relatively wide range. It consisted of a single-break switch with two ¼-in. diameter fine silver contacts, one of which was stationary and the other attached to a flexible bronze spring. Long, fine silver ribbons provided the current connection from the moving contact to a fixed terminal. Separating the contacts was a steel yoke attached to the end of a geared rack having a uniform linear speed. This rack was driven through a gear by a pinion coupled to an adjustable-speed motor unit which provided pinion shaft speeds of about 25 to 1,000 r.p.m. The rack was returned manually to the starting position.

Arc energy measurements were made at twelve different contact speeds ranging from 0.2 to 16.7 in. per second. For speeds above 2 in. per second the apparatus was used as shown in the accompanying sketch; for speeds below this, two sets of gears giving a 9 to 1 speed reduction replaced the coupling.

The test showed that contact speeds between 1 and 4 in. per second produce the lowest arc energy, confirming practical experience obtained with controls for a.c. heating appliances. During preliminary tests it was noticed that with new contacts the maximum arc energy was higher than with contacts subjected to some arcing.

•

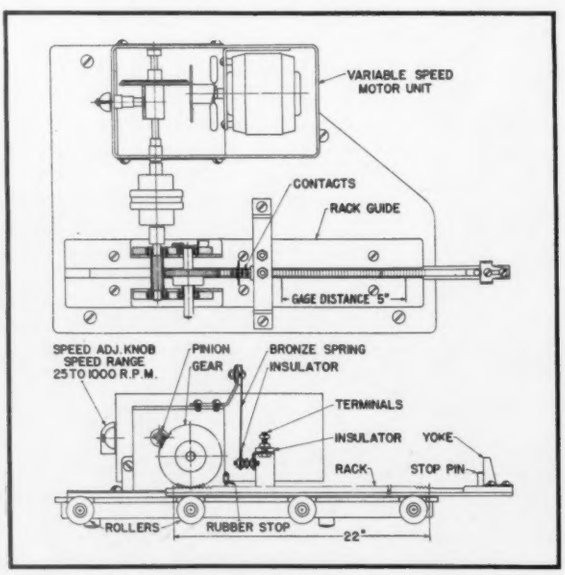
Cleans Meter Parts in Less Than 5 Minutes

A small machine, only 18 in. high and occupying about 1 sq.ft.of bench space, is capable of cleaning, rinsing and drying meter parts thoroughly and quickly. The motor takes about 25 watts and the heater is rated at 60 watts, as is stated in the *Power Service Bulletin*, published by the Manchester Corporation, England.

Attached to the motor shaft is a mesh basket, 2¼ in. in diameter and 1½ in. deep, into which the parts to be cleaned are placed. A pillar supports the motor above the middle of the rectangular cast metal base in which are spaces for three glass jars containing the washing liquids and also a drying chamber of similar dimensions containing the electric heating element. On the front of the metal stand is a large boss carrying two tumbler switches, one controlling the motor and the other the heating element. Between them is a rheostat for regulating the speed of the motor. Moulded bakelite screw-on covers are provided for sealing the jars when the machine is not in use.

Connected to the motor shaft above the basket is a three-bladed screw or propeller designed to force the cleaning fluid through the basket. The square shape of the glass jars and the fixed metal blades which dip into the body of the fluid partly check the tendency of the fluid to swirl when the basket is rotated at a high speed. The blades break up the flow by causing agitation of the fluid, thus insuring complete and thorough cleaning.

Ballistic wattmeter aids arc energy study



Contact-speed test apparatus design

IF YOU SELL APPLIANCES — OR WANT TO PROMOTE ADEQUATE WIRING . . . .

Look into the FUSTAT

1 **Thermal Cutout.** Stops needless blowing on starting currents of washing machines and other appliances — yet opens to protect if wiring is dangerously overloaded.

Permits washing machines, ironers, refrigerators, etc., to be plugged in on circuits already well loaded — without needless blowing of fuses.

This wipes out many useless service calls that irritate customers and often cost dealer time and money — particularly if made during the guarantee period.

2 **Fuse Strip.** Prevents hazardous burnout of short-circuits.

Shorted cords on lamps, irons, cleaners, etc. must be kept from burning up — shorted sockets, attachment plugs, etc., must be kept from sputtering hot sparks.

As is well known there is no substitute for a proper size fuse to protect against such commonly occurring shorts.

On short-circuits, the Fustat, because it has a fuse, opens the circuit before dangerous arcing can occur.

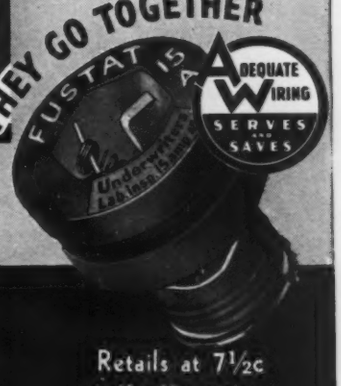
3 **Fustat Base.** Prevents destruction of circuit wiring from overloading . . . Permits adding any number of outlets to a circuit . . . Eliminates low voltage complaints due to overloading — because it keeps the circuit from being loaded beyond capacity.

Once the proper size Fustat is installed it cannot be replaced with substitutes or sizes that are too large.

Retails at 7½c

If circuits are not adequate, the user cannot dodge the issue by bridging the fuse or by over-fuseing and sacrificing safety.

The Fustat fits Edison base fuseholders through the use of an inexpensive adapter that locks in place.



The FUSTAT

For Full Information write to any of these Firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c
in 15 to 30 amp. sizes

LOAD BUILDING

Lighting in a School Improvement Program

By P. A. WINCHELL
Illuminating Engineer,
South Carolina Power Company

A SURVEY of the existing school plant in Charleston, S. C., made in 1937, resulted in a fifteen-year program of improvement in which modern ideas of schoolroom lighting play a large part. The accompanying illustrations show what is being accomplished. At the time of the survey the public school plant consisted of five buildings devoted to elementary school purposes for white children, a high school each for white girls and boys, a vocational school for whites and four school buildings for colored children.

The school buildings in Charleston (with the exception of two new buildings constructed during the past year) average from 50 to 75 years in age. Naturally these older buildings had practically no lighting at all, or, at best, a few makeshift installations consisting of drop cords with bare lamps and perhaps a few "kitchen units." We were consulted on the job. Lighting layouts have been made by our department for all of the old buildings and a number of installations have been made to date. The two new schools are, of course, equipped with adequate and efficient modern lighting.

•

Helping Farmers to Clear Land

By LARRY MOORE
Agricultural Engineer Portland General Electric Company, Portland, Ore.

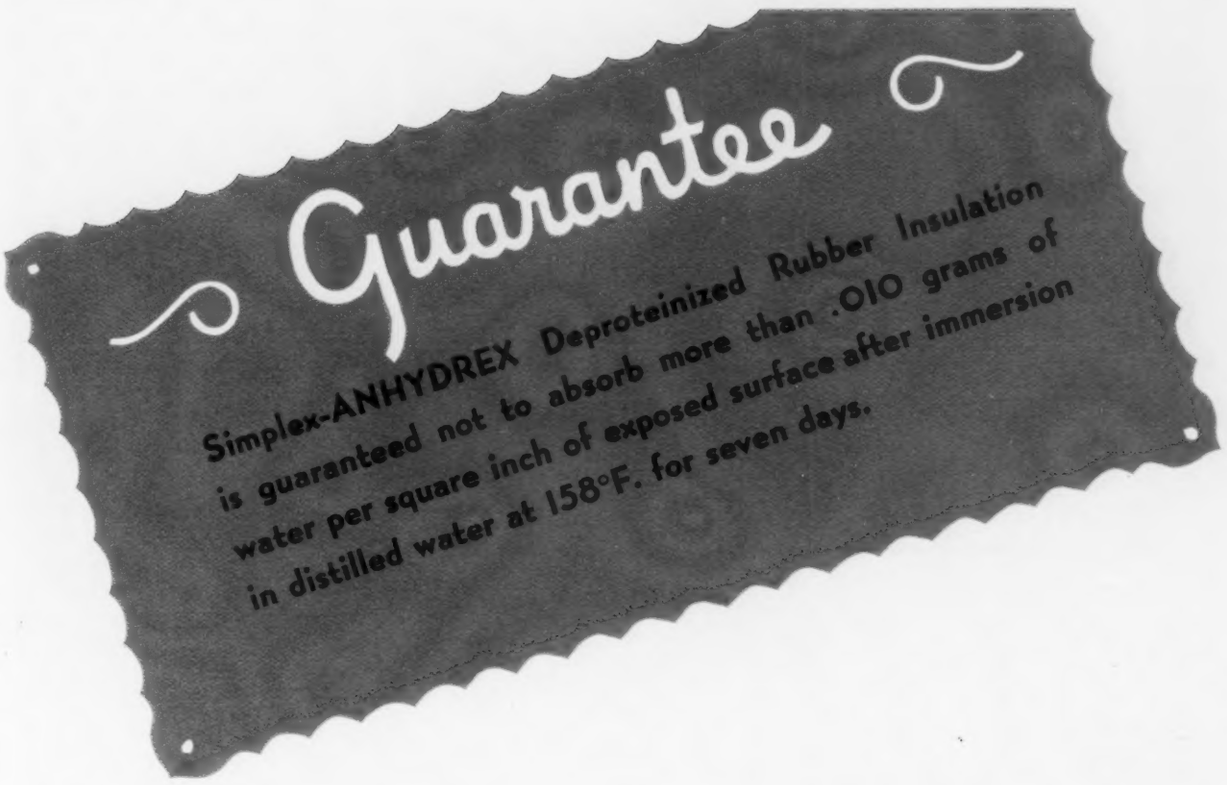
While forced-draft stump burning probably will never produce any overwhelmingly big electric loads, it presents many possibilities for benefits to both the electric utility and its customers. It is for this reason that rural service representatives of Portland General Electric Company (Pepco) are giving more attention to promoting this type of load than would seem to be justified on the basis of revenue alone.

A great deal of land in western Oregon awaits profitable cultivation once stumps are removed, and land clearing is a spring and autumn job for many farmers. What forced-draft stump burning offers these farmers is the chance to clear their fields at an operating cost of 15 cents per stump, whereas dynamiting costs $2 to $6 or more per stump, takes more work and throws up objectionable subsoil.

The method consists of cutting or boring holes into solid wood, where fire is started. The flame is fed with air from nozzles consisting of $\frac{3}{8}$-in. pipe. Up to sixteen or more nozzles are fed through hoses from one blower. Such an outfit permits burning three stumps at a time. A $\frac{1}{4}$-hp. motor suffices to drive the blower.

This spring Pepco took an active part in stump burning in Clackamas County, working closely with J. J. Inskeep, the county agricultural agent. Procedure was to schedule a

Then and now lighting in a Charleston school


Guarantee
Simplex-ANHYDREX Deproteinized Rubber Insulation
is guaranteed not to absorb more than .010 grams of
water per square inch of exposed surface after immersion
in distilled water at 158°F. for seven days.

Water always has been the arch enemy of insulated power cables. Of all trouble making hazards to which cables were exposed, it was the chief. Of all standard power cable insulations there were none that would not absorb water. A high grade insulation was needed which required no lead sheath or other protection from water.

Simplex had already made the first hard service, rubber sheathed flexible cable with reenforced 60% rubber jacket, the first tree wire with non-metallic, non-inductive abrasion resistant protection, the first thin insulation for conductors using prevulcanized rubber latex.

With this background it was only natural that Simplex should come through with another first. In 1932 came Simplex-ANHYDREX, the first rubber insulation that could protect itself from water. Lead sheaths are unnecessary with Simplex-ANHYDREX insulation.

Ordinary rubber contains proteins which absorb water. Taking these proteins out makes rubber non-water absorptive and removes the cause of most cable failures. The electrical and physical properties of the rubber remain unchanged. Simplex-ANHYDREX is the only insulation made from deproteinized rubber.

ANHYDREX insulation will save money for you when your cables are to be exposed to water or moisture. Simplex-ANHYDREX insulated cables are ideal for use under water, in wet ducts or they can be buried directly in the ground. Omission of the lead sheath makes a lighter cable and assures freedom from electrolysis, corrosion and other sheath troubles.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex-ANHYDREX

deproteinized rubber insulation for wires and cables

Seeing is believing.
In western Oregon stumps of this size often require $8 to $10 worth of powder for removal —and leave a sizable hole to fill, as well as a problem of disposing of the stump after removal. The electric method does the job for 10 to 15 cents per stump and leaves no objectionable subsoil to depress yields on new land.

demonstration in some farmer's field. Farm-equipment dealers as well as other farmers were urged to attend. Pepco service men as well as agricultural agents would be on hand to explain the finer points of stump-burning procedure. These proved highly successful. At one demonstration the host farmer said: "Keep 'er going for a few minutes boys. I've got a couple of friends down the road and I'm going down to get 'em. They ought to see how this thing works."

Dealers Become Interested

This spring, in an area embracing parts of Clackamas, Yamhill, Washington and Columbia counties, some 30 units were sold. In addition, nine dealers adopted multi-nozzle blowers as part of their regular stock. Most of these were dealers who are in close touch with farmers.

This may seem like a trivial load. But, on the other hand, sale of stump-burning equipment fits nicely into a program for developing the small, marginal, backwoods customer. The usual customer is in the low-use bracket—using 25 to 40 kw.-hr. per month. In most cases the extra 40 kw.-hr. required for stump burning is his first experience with lower rate steps. Thus he has a pleasant introduction to the low-cost benefits that electricity can bring.

Furthermore, if a farmer can clear more land with less work, he can enlarge his farming operation. The utility thus gains a customer—one who has been converted into a prosperous citizen by the benefits of electricity itself.

Water Heating Field in Stores and Shops

By G. GILL FREYDER
Supervisor Lighting Sales Department, Commonwealth Edison Company, Chicago

Since introduction in Chicago nearly a year ago of controlled service for commercial electric water heating, salesmen have been making a survey of all stores and plants called upon in their daily business in order better to analyze the market for electric water heating in commercial and industrial establishments. Approximately 1,500 surveys have been tabulated giving information as to the type of business and whether water heating was used. The results are shown in the accompanying table.

Fifty-three per cent of the customers called upon had water heater, 30 per cent were furnished hot water by a central heating plant in the building and 17 per cent had none. Only 10 per cent of these establishments had automatic heaters. Forty-three per cent are using non-automatic heaters. These are the potential customers for electric water heaters and will be most interested in trade-in and installation allowances.

The Hot Towel Market

The neighborhood barber shop appears to be a good prospect. His demands are small, therefore the potential load is not great. The monthly bill will run from $1.50 to $2. The carefree, highly efficient tank appeals to him. It can be installed in his shop and fits in very well with his usual fixtures. Seventy-five per cent of the barbers have water heaters, but only 12 per cent have automatic heaters.

The grocery, delicatessen and meat market can be adequately taken care of with a medium size tank. We have made several installations for this type of business, the monthly service ranging from $4 to $5.

Beauty shops and restaurants are a problem. They use such large quantities of hot water. The small restaurant, washing dishes by hand, uses from 1 to 1½ gal. of hot water per meal. A small place will use from 400 to 500 gal. daily. Much of this water is used during the non-charging hours. We have been very careful in installing heaters in these two lines of business.

Industrial applications offer a large load. Hot water must be furnished in washrooms, and this is a problem when the heating plant is shut down for the summer. We have installed four heaters in industrial plants and the monthly bill for electricity used in heating water ranges from $4 to $10.

Existing Sources of Hot Water in Commercial Establishments

Compiled from salesmen's survey from September 30 to January 30, 1938

	Building Year Around	Building Winter Only	Side Arm Gas	Automatic Gas	Gas in Summer Boiler in Winter	Coke or Coal	Oil	None	Total
Taverns	58	11	91	21	10	38	5	30	264
Barbers	90	0	140	38	11	20	4	1	304
Food stores	35	7	49	10	7	16	1	70	195
Restaurants	19	0	44	24	3	12	0	2	104
Beauty shops	64	0	24	23	3	6	0	0	120
Drug stores	27	0	14	10	5	4	1	3	64
Meat markets	9	4	25	1	1	10	0	52	102
Tailors — cleaners	6	0	6	1	0	2	0	11	26
Gas stations	0	3	0	0	0	1	0	11	15
Doctors — Dentists	23	1	0	2	0	0	0	0	26
Laundries	4	0	1	1	0	1	0	1	8
Miscellaneous	54	15	33	17	5	32	10	65	231
Total	389	41	427	148	45	142	21	246	1,459
Per cent	26.7	2.8	29.3	10.1	3.1	9.7	1.4	16.9	

All the advantages of an independent contractor
Plus
THE GREATER DEPENDABILITY OF A SINGLE RESPONSIBILITY
Hoosier Service offers power companies the facilities not only of an outside contractor, but also of one already organized for concerted action and well-schooled in dependable, efficient erection.

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CHICAGO 46 SO. FIFTH ST., COLUMBUS, OHIO NEW YORK

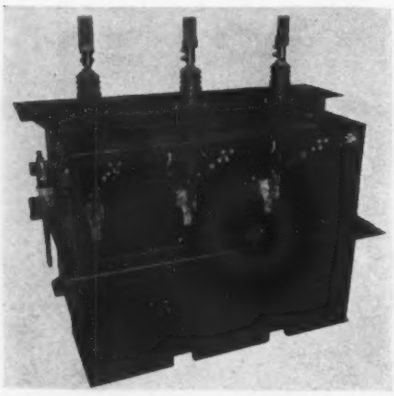
Canadian Hoosier Engineering Company, Ltd., Montreal, Canada.

ERECTORS OF TRANSMISSION LINES

NEW EQUIPMENT

Metal-Inclosed Disconnect

Safety was predominant thought of engineers designing this metal-enclosed, group-operated switch installed below a type H breaker and connected to leads in



Metal-inclosed disconnect; 7.5-kv., 600-amp., three-poles. **Delta-Star Electric Co.**, Chicago, Ill.

concrete cell structure. Switch with full-floating blades and line-pressure contacts is operated by hook-type handle with key to lock in open or closed positions. Windows permit inspection of each pole; screwed-type cover completes enclosure.

•

Clip-On Ammeter

Multi-range Clip-On ammeter; reads from 0 to 1,000 amp., with five full scales of 0-10/25/100/250/1,000 amp.; single set of scale divisions, with scales multiple of 10 or 25. **Ferranti Electric, Inc.**, New York, N. Y.

New five-range clip-on ammeter reads from 0 to 1,000 amp., has 2¼-in. rectifier opening adapting it for use on square bus-bars as well as on round cables.

•

Voltage Regulator

"GB-1" automatic alternator voltage regulator. **Burlington Instrument Corp.**, Burlington, Iowa.

New voltage regulator is adapted to the control of small alternators of the separately excited type whose exciter field currents do not exceed one ampere at maximum load on the alternator. Alternator voltage is impressed across regulator coil and series voltage-dropping resistor, which decreases voltage error due to frequency changes. Current flowing through coil acts to pull floating iron cores upward, opening the contacts. When closed, contacts short out exciter field rheostat; when open, they allow full resistance in exciter field circuit. When alternator voltage is normal, contacts cut exciter field rheostat alternately in and out of circuit, 120 times per second, regulator response thus being ½ cycle.

•

Wire-Wound Resistor

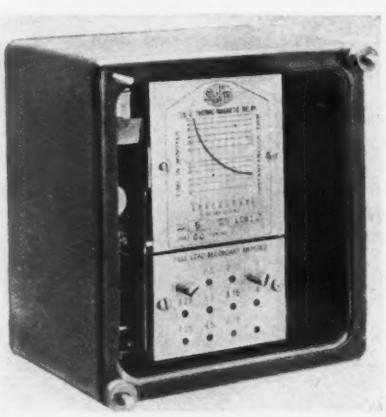
"New Vitrohm" resistor. **Ward Leonard Electric Co.**, Mount Vernon, N. Y.

New vitreous-enameled wire-wound resistor has a crazeless enamel structure said to withstand humidity, moisture, immersion and numerous other specified tests.

•

Thermo-Magnetic Relay

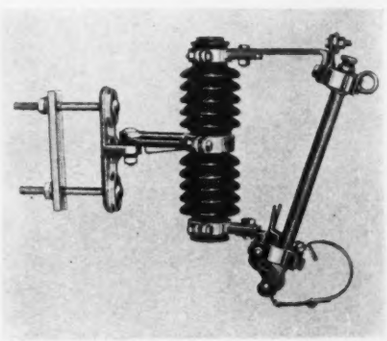
Relay is designed for protection of a.c. apparatus subject to overloads, either momentary or continuous. Time delay element is new type of device consisting of heater and bi-metallic strip combination, compensated for ambient temperature, so the relay can be remotely located from the apparatus being protected and operated on current values without influence from other variables. Heating rate of bi-metallic strip is controlled to match approximately heating rate of windings of protected apparatus. Instantaneous element operates at 10 times minimum operating current determined by tap setting.



Type "DT-1" thermo-magnetic relay; circuit-closing and circuit-opening types, 2.5 to 5 amp. secondary. **Roller-Smith Co.**, Bethlehem, Pa.

Open-Type Cutouts

A number of improvements have been made in this company's non-dropout, open-type, indicating "Fuswitches". "Pullinks" are attached to the expulsion-type fibre fuse-holders and melt to indicate outage;



"Fuswitch," Catalog 1403-6, in fused position; 5-, 7.5/12.5- and 15-kv., 100 amp. **W. N. Matthews Corp.**, St. Louis, Mo.

no burnt tubes are said to result when the links melt out. No outages are said to occur from overtensioning fuse links, maximum possible tension being 17 ounces. Fibre tubes are capped so they will not fill with water; the cutouts are said also to be sleet and snowproof.

•

Pointer-Stop Instruments

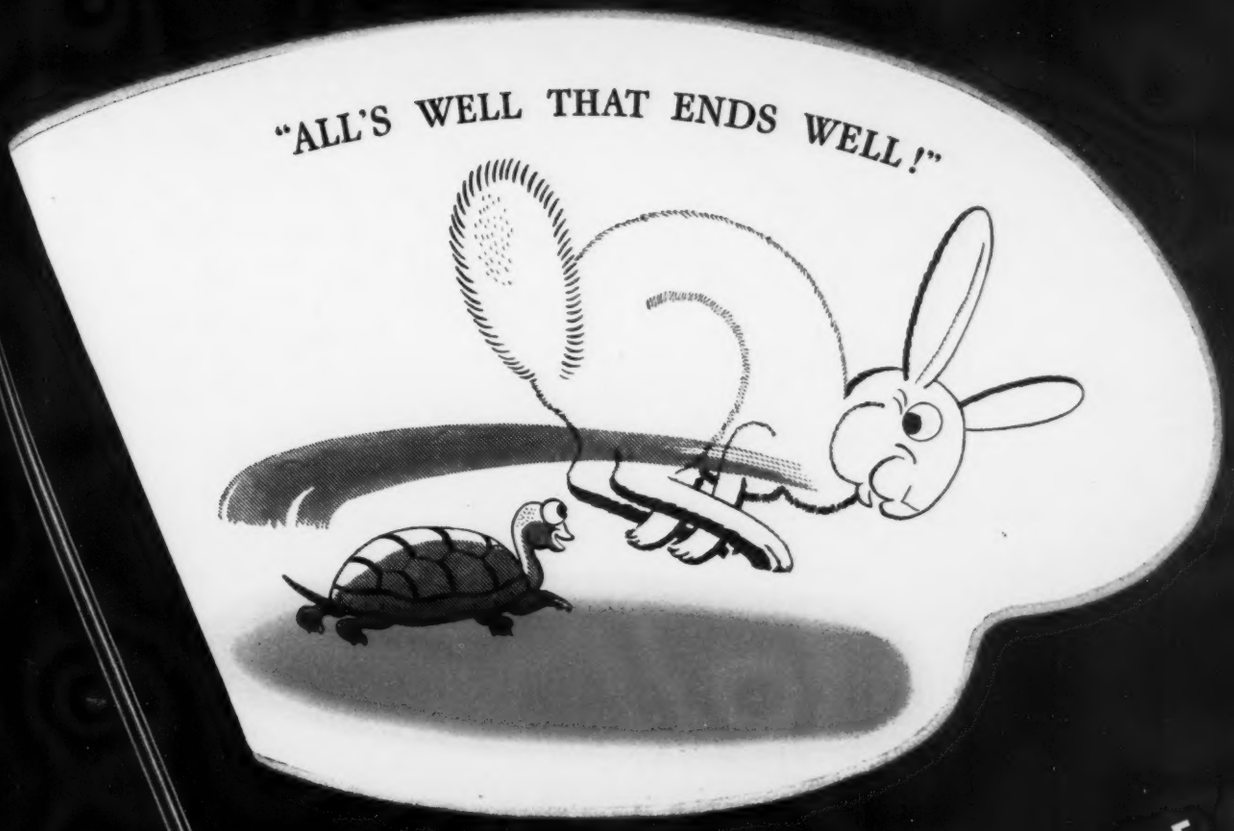
Type "AP-9" pointer-stop instruments. **General Electric Co.**, Schenectady, N. Y.

Measurements of welding current, motor-starting current, voltage dip and other currents or voltages of short duration may be made with new pointer-stop instruments. On ammeters, an adjustable stop, micrometer-screw actuated, is arranged to push the pointer up-scale; on voltmeters, the stop is designed to push the pointer down-scale. Measurements are made by successively setting the adjustable stop until a position is reached where indicating pointer barely moves in response to current or voltage impulse, at which point r.m.s. current or voltage is indicated.

•

Evaporative Cooler

Expressly designed to cool fluids in a closed system, this evaporative cooler includes the cooling of transformer oil—for reduction of core losses through maintenance of lower oil temperatures—among



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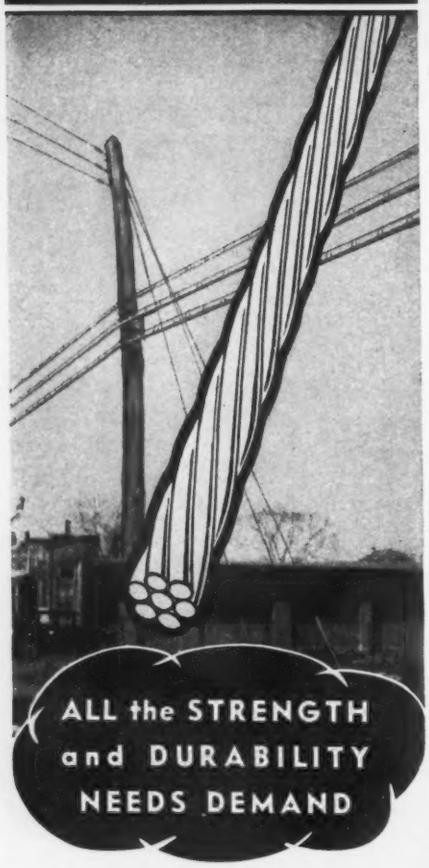


ALL the STRENGTH and DURABILITY NEEDS DEMAND

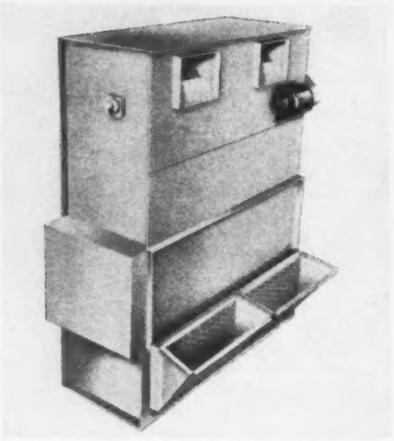
The superior tensile strength that only steel can give . . . . the ruggedness to withstand severe punishment . . . . the ability to outlast normal needs . . . All these are combined—with outstanding economy—in *Crapo* Galvanized Guy and Messenger Strand.

Long life and low maintenance costs are characteristic of this time-tested product. Heavy, ductile, tightly-adherent zinc coatings, applied by the *Crapo* Process, provide lasting protection against corrosion. The inherent strength and endurance of the steel makes for dependable, maintenance-free service.

Crapo Galvanized Steel Strand is readily available in all standard grades and sizes from representative jobbers.

Crapo Galvanized Products also include *Crapo* HTC-130 and HTC-80 Steel Conductors (Solid and Stranded 3-Wire), Construction Wire, Tie Wire and Ground Wire.

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA



Evaporative cooler; capacities range from 2,000 to 20,000 cu.ft. per minute, with pump motors from ¼ to 1 hp. and fan motors from ½ to 7½ hp. **The Trane Co.**, La Crosse, Wis.

its applications. Heat flows from liquid within the coil to spray water outside coil due to difference in temperatures; heat also flows from spray water on outside of coil to air through evaporation. Spray water is continually recirculated, making for practically constant temperature. Units are offered for indoor or outdoor operation.

•

Pole-Strapping Tool

This hand tool for tensioning 2-in. by 0.050-in., flat steel bands around car loads of poles has been reduced in weight by about 60 per cent through the use of nickel steel in place of carbon steel. This also reduces the effort required by one man in tensioning the bands over 10 per

"Heavy-duty Unit-Load Stretcher, No. 1635-X." **Acme Steel Co.**, Chicago, Ill.

cent and reduces the effort required to release the tensioning mechanism by 25 per cent. A tension of approximately two tons may be developed by the pull of one man on the operating handle, it is stated.

•

Lighting Units

Industrial concentrators, in two sizes, for 200-watt bulb and for 300- or 500-watt bulb; clear or stippled spread lens, 10- and 14-in. Concentrating type, two-lamp fluorescent luminaire and spread-type single-lamp luminaire, for 110-120 or 220-240 volts. "VHR-18" floodlight, uses 750-, 1,000- or 1,500-watt bulbs. **Westinghouse Electric & Mfg. Co.**, Cleveland, Ohio.

Recent lighting developments of this company include two new industrial units for concentrated lighting, fluorescent luminaires for industrial lighting and floodlight units with swivel cover glass. Concentrators are suggested for fine assembly work, inspection, spray booths, exact machine work or paint shops, to give supplemental lighting on horizontal or vertical surfaces from an oblique angle. Fluorescent units are suggested for general or supplementary lighting applications where an efficient, low-brightness, extended source is required. Floodlights are announced for floodlighting sports areas, service stations, construction projects and industrial yards.

•

Electrical Hoists

To widen the field of hoist application, this company has developed explosion-proof electrical equipment. So equipped, the hoists have explosion-proof motors rated at 30 min. 55 deg. and explosion-proof reversing starters, together with geared up-

"P&H" hoist equipped with explosion-proof electric equipment. **Harnischfeger Corp.**, Milwaukee, Wis.

per and lower limit switches and push-button stations. Wiring is in rigid conduit with explosion-proof fittings and electric brake is enclosed in cast-iron cover bolted to gear case cover. To reduce further possibility of sparking, flexible cable connection with spark-proof trolley wheels is used. Oil refineries, chemical plants and paint mills, dusty portions of cement and grain mills are suggested applications.

•

Filter Control

"Filter Watchman." **Simplex Controls**, St. Louis, Mo.

Attachable to commercial or domestic air conditioning units, this new device flashes a light signal to indicate time for cleaning or changing air conditioning equipment filters. Accessory consists of a dual metal disc about 12 in. in diameter on which is mounted a housing containing the contact device that flashes a lamp signal when excess static pressure is built up in the unit between the filters and the blower.

•

"Insuliner"

"Insuliner"; in conduit sizes from ½ to 3 in. **The Thomas & Betts Co.**, Elizabeth, N. J.

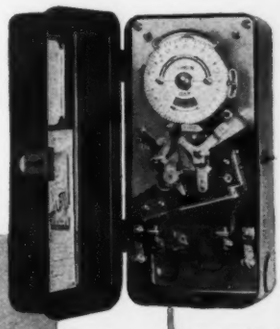
This device both insulates and lines the bushing and the conduit and can be used with any outlet for wires, the manufacturer states. It is split to fit over the conductors and snaps into the bushing, the overlapping ends adjusting it to normal variations in

STREET LIGHTING CONTROL

MODERN *with* SANGAMO ASTRONOMIC DIAL TIME-SWITCHES

Sangamo Astronomic Dial Time-Switches fulfill the exacting requirements for modern street lighting control. Three types of driving movements meet a wide range of service conditions. Two of these are for use on controlled frequency circuits: the straight synchronous motor drive, and the latest development, the synchronous motor drive with electrically wound carryover, which provides for operation of the switch during ordinary service interruptions. The third is the electrically wound movement with 20-hour carryover and full-jeweled escapement for either alternating or direct current service. Furnished for indoor or outdoor mounting, or, in certain types in the socket construction, Sangamo Astronomic Dial Time-Switches are available for any conceivable public lighting control application.

The ten-hour carryover feature of this Form VSWZ Astronomic Dial Time-Switch functions automatically during current interruptions. Normally, no re-setting is required the year around.



Automatic convenience at economical first-cost is provided by this Sangamo Form KAZ Astronomic Dial Time-Switch.

Model F, Form VSFZ Astronomic Dial Time-Switch in standard socket construction. Time can be set through opening in cover.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

You save in installation costs

5

Pennsylvania Transformers are delivered with *radiators permanently welded to the tank* and *completely filled with oil.* This eliminates the inconvenience and cost incident to attaching radiators and filling with oil after delivery. The air is removed by vacuum process from the core, coils and oil before shipment . . . an added advantage possible only with this type construction.

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Investigate the Pennsylvania line!

Pennsylvania

TRANSFORMER COMPANY

1701 ISLAND AVENUE, N. S. PITTSBURGH, PA.

conduit diameter. Rounded mouth of the device covers bushing shoulder and its long skirt shields the end of the conduit.

•

A.c. Arc Welder

To provide for safe operation, this welder has no electrical or mechanical connection between power lines and welding leads, the manufacturer states. An efficiency of 95 per cent as measured by kilowatt input is claimed for the unit. Striking or arc-holding voltage increases as welding rate is reduced to make for a stable arc. Combination of large ring and inner switch gives 30 steps of current adjustment. Inner control can also be used to disconnect welder from power line without pulling power plug or shutting off line switch.

"Transarc" a.c. arc welder; range of 20 to 200 amp., for use on 220 volts, single-phase. **Hobart Brothers Co.**, Troy, Ohio.

•

Motor Base

"Automatic" motor base. **Ideal Commutator Dresser Co.**, Sycamore, Ill.

New motor base is said to be suited especially to short center drives; it maintains correct belt tension through action of springs. Motor is mounted on sliding plate of base and complete motor and base is then bolted down as a unit.

•

Self-locking Nuts

"Elastic Stop Nuts." **Elastic Stop Nut Corp.**, Elizabeth, N. J.

Designed originally for apparatus subject to heavy vibration, this line of self-locking nuts is now offered in any metal and in any combination of style, size and thread system. Nuts incorporate a resilient non-metallic collar.

•

Arc Welding Electrode

"Fleetweld 10;" in two sizes in 18-in. lengths, ¼- and 5/16-in. **The Lincoln Electric Co.**, Cleveland, Ohio.

New arc welding electrode is said to facilitate finishing operations on welded products by eliminating need for dressing or smoothing welded seams in many applications. It is designed particularly for finish bead welding on "U" groove welding in downhand position.

Exide-Ironclads... PLUS Exide Efficiency Equipment

Exide's newest development, a 24-cell, 21-plate Exide-Ironclad Battery of the MEH type. More than 45 kilowatt hours available in a single unit! Designed to operate modern heavy duty trucks at full speed throughout an entire shift without battery change.

Exide Test Kit which, with Exide Odometer, determines size and type of battery required for any electric industrial truck on any materials-handling job.

Exide Charge Control Unit. Automatically controls charging rate and signals when battery is charged.

Exide Discharge Indicator. Signals when a freshly charged battery is needed.

. . . insure maximum production with minimum costs in material-handling

EXIDE keeps pace with—and anticipates—industry's ever-broadening needs. As greater production-demands brought better, bigger industrial trucks, capable of handling ten to fifteen-ton loads . . . Exide developed new, tremendously powerful Exide-Ironclads to operate them efficiently and economically. To the MVM and TLM Exide-Ironclads were added the oversize Types FLM and MEH, compact units of amazing power, with capacities of 700, 800, 900 and 1000 ampere-hours at the normal discharge rate.

But even good batteries require proper care. So Exide developed the Exide automatic Discharge Indicator, which gives visual warning when an Exide-Ironclad is approaching discharge. This contributes to better truck performance, and eliminates the possibility of schedule-destroying "tow-ins."

For still better service to Exide-Ironclad users, Exide developed the Exide Charge Control Unit, which *automatically* controls the charging rate of batteries, automatically cuts the circuit and signals when the charge is complete.

Exide also developed the Exide Odometer and Exide Test Kit, with which it is possible to determine what type and size of battery is needed to obtain the utmost efficiency from any electric industrial truck.

Let the Exide System solve your material-handling problems. Rugged, long-lasting Exide-Ironclads and these new auxiliary aids will enable you to move more material, move it faster, more efficiently, more economically. Write for full details.

Exide
IRONCLAD BATTERIES
With Exide **MIPOR** Separators
"MIPOR," Reg. U. S. Pat. Off.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

MANUFACTURING - MARKETS

Report Refrigerator Sales Drop in July

After showing a less-than-seasonal decline in June from May, with the June total setting a record for that month, electric refrigerator sales declined quite sharply in July, according to reports to the National Electrical Manufacturers' Association. July sales of 152,726 household electric refrigerators in the domestic market represented a decline of 39 per cent from the total for June, this year. In 1938 July showed a drop of only 15 per cent, in 1937 the decline was 28 per cent and it amounted to only 14 per cent in 1936.

The sales for July and the first seven months of 1939 compare as follows:

	July		Seven months	
	Domestic	World	Domestic	World
1939..	152,726	168,196	1,468,516	1,578,198
1938..	82,825	95,154	940,507	1,049,677
1937..	179,414	192,052	1,765,863	1,902,742
1936..	186,639	206,019	1,498,459	1,616,912
1935..	140,250	152,364	1,146,231	1,224,118
1934..	101,511	111,313	944,511	1,003,150

Domestic sales of household electric refrigerators by seventeen companies amounted to 152,726 units in July, compared with 82,825 units in July last year and 250,045 units in June, 1939, according to the National Electrical Manufacturers Association. World sales in July were 168,196 units, against 95,154 in July last year, and 268,154 units in June, 1939. Domestic sales for the first seven months of 1939 were 1,468,516 units, against 940,507 units in the same period last year. World sales for the seven months were 1,578,198 units, against 1,049,677 units last year.

•

Manufacturers' Sales Continue Gains Over '38

Manufacturers' sales of electrical machinery, apparatus and supplies during July, as reported by 92 firms, were valued at $31,296,000, a decrease of 10.5 per cent from June, but 26.2 per cent above July last year, according to the Department of Commerce.

Manufacturers' sales for the different industries, as reported by 1,620 firms, totaled $305,431,000 for July, a decrease of 7.6 per cent from June and 12.8 per cent above July, 1938.

•

Westinghouse Cites Wide Purchasing

Pointing out to its 50,000 stockholders that a large modern manufacturing company is an enormous buyer as well as a big seller, Westinghouse Electric & Manufacturing Co. in its quarterly report revealed the extent of its own purchases—more than $100,000,000 annually, from all 48 states and Alaska and from twenty foreign countries. Biggest purchases by Westinghouse are steel and iron and their products. Copper, insulating yarn, carbon brushes, and clay for porcelain products are bought in immense quantities. Farmers share abundantly in the purchases of Westinghouse, the report points out.

The company's demand for articles and services from outside sources annually gives work to about 36,000 persons, in addition to its own 43,000 employees.

•

Elephant Butte Power Equipment Contracts Let

Power equipment costing $130,864 for the Elephant Butte Power plant, Rio Grande project, has been ordered by Secretary of the Interior Harold L. Ickes. General Electric Co. will furnish four transformers, a switchgear, a Petersen coil and other equipment for $99,500. Allis-Chalmers Manufacturing Co., on a bid of $31,364, was awarded a contract for furnishing two oil circuit breakers.

Steel Concern Places Order for Generator

Order for a 10,000-kw., 3,600-r.p.m. topping steam turbine and generating unit to augment the capacity of the Weirton Steel Company, Weirton, West Va., has recently been placed with the Allis-Chalmers Manufacturing Co., Milwaukee. The complete order is said to run slightly less than $300,000.

The unit will be of the impulse-reaction type designed for an initial steam pressure of 800 lb. with a total temperature of 800 deg. F. Exhausting at 225 lb., it will operate in connection with existing low-pressure units at the purchaser's plant.

The generator will be designed for three-phase, 60-cycle, 6,900-volt operation. While rated 10,000 kw. at 80 per cent power factor, the unit will be good for a capacity of 12,500 kw. at 100 per cent power factor.

•

Seeks Comments on New Transformer Standard

Underwriters' Laboratories, Inc., is about to issue a new edition of the Standard for Transformers, which will be known as the Standard for Specialty Transformers. Before printing this new edition the laboratories is desirous of obtaining comment and criticism. To those interested a copy of the preliminary draft of the proposed revision will be sent for review and comment.

•

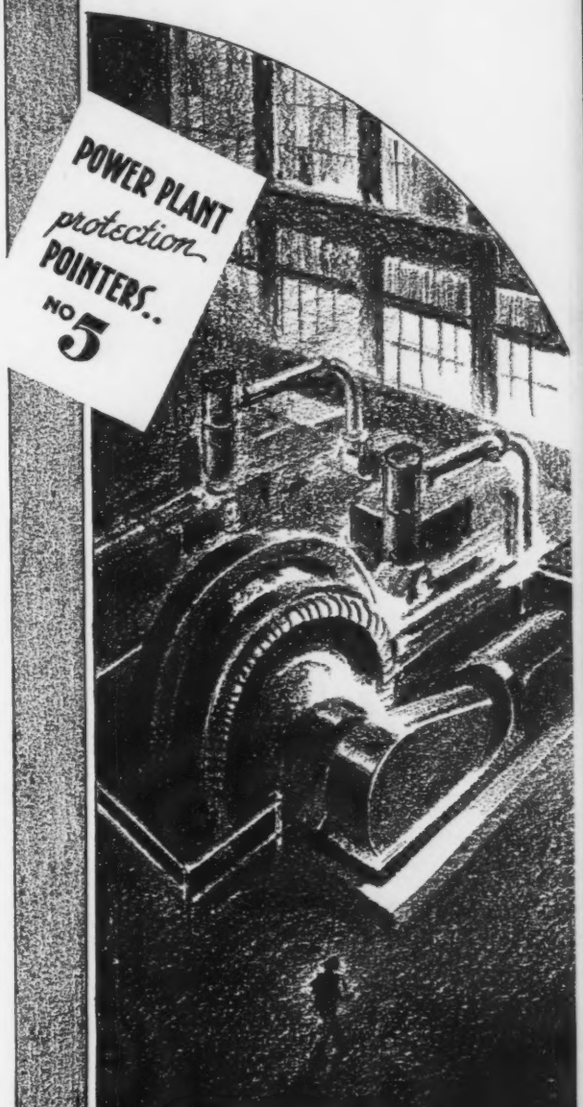
Blaw-Knox Gets Order

Indication of a pick-up in utility construction is seen in an order received by Blaw-Knox Co. from Commonwealth Edison Co. for 500 transmission towers involving approximately 5,800 tons of steel. These towers include the latest improvements in design

MONEY

in your pocket ...

... through prompt restoration of service and reimbursement of losses.



"The show must go on" . . . continuity of service must be maintained. Conditions which impair efficiency . . . or shorten useful life . . . cause faulty operative practices . . . or cause accidents . . . MUST BE ELIMINATED. That's the purpose of "Ocean and Columbia" protection.

But when accidents do happen, it's supremely important to you and your customers to restore service. "Ocean and Columbia" engineers immediately appear on the scene. They are there to see that you are reimbursed promptly and equitably. They are there to help you get back into normal operation in the quickest possible time. And they're not given to quibbling over technicalities, either!

Under an "Ocean and Columbia" policy . . . you're money in pocket. **Your losses** are paid promptly by one of the strongest financial organizations in the world.

INDUSTRIAL and UTILITY POWER PLANT insurers

THE OCEAN ACCIDENT & GUARANTEE CORPORATION
COLUMBIA CASUALTY COMPANY

One Park Avenue, New York, N. Y.

Pacific Department: 315 Montgomery Street, San Francisco, California
Canadian Branch: The Ocean Accident & Guarantee Corp., Ltd., Federal Building, Toronto, Ontario
Cuban Correspondent: Compania Cubana de Fianzas, Amargura 23, Havana, Cuba

You were right about

UPTEGRAFF TRANSFORMERS

THEY ARE GIVING PERFECT PERFORMANCE

— and perfect performance comes only from quality and service designed and built into Transformers.

Here, in a plant that is newly and splendidly equipped solely for the building of Transformers, "Quality and Service" in Transformer design and construction is paramount. You cannot know its full meaning until you install Uptegraff Transformers.

Uptegraff Transformers are designed and built in capacities up to 10,000 KVA, 69,000 volts — all in strict accordance with the rigid requirements of NEMA and AIEE.

On your next installation assure yourself the satisfactory performance that is yours with Uptegraff Transformers.

R. E. UPTEGRAFF MANUFACTURING COMPANY

SCOTTDALE, PA.

and fabrication and will be used to extend the utility's service between Powerton and Crawford, Ill., a distance of about 130 miles.

•

Servel Special Dividend

Servel, Inc., has authorized a special dividend of 25 cents on the common stock. Previously, the company declared a dividend of 25 cents, which was payable September 1.

•

Mailing List Houses

Announcement has been made of the compilation of a Directory of Mailing List Houses throughout the United States. The directory was compiled by Thomas J. Davis, business information section, division of business review, Bureau of Foreign and Domestic Commerce, Washington, D. C.

•

Polaroid Corp. Moves

Announcement has been made that the Polaroid Corporation is moving from its present location at 285 Columbus Avenue, Boston, Mass., to enlarged quarters on Main Street, Cambridge, Mass. Occupancy will take place in about a month.

•

New Broadcasting Station

Equipment is now being built for the construction of a new broadcasting station in Schenectady that will operate on the recently announced frequency modulation system developed by Major Edwin H. Armstrong, according to C. H. Lang, manager of broadcasting of General Electric Co. It is expected that the new station will go on the air this fall.

•

Resume Common Dividend

Cutler-Hammer, Inc., has resumed dividend payments on the common with a declaration of 25-cent disbursement payable on September 15. This is the first payment since December 15, 1937, when a similar amount was paid.

New York Metal Prices

	Sept. 5, '39 Cents per Pound	Aug. 30, '39 Cents per Pound
Copper, electrolytic	12.50*	10.50*
Lead, Am. S. & R. price	5.25	5.05
Antimony	12.00	12.00
Nickel Ingot	35.00	35.00
Zinc, Spot	5.89	5.14
Tin, Straits	49.75	49.00
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.

A NEW, FAST, LOW-COST WAY TO REMOVE STEEL POWER-LINE POLES FROM CONCRETE

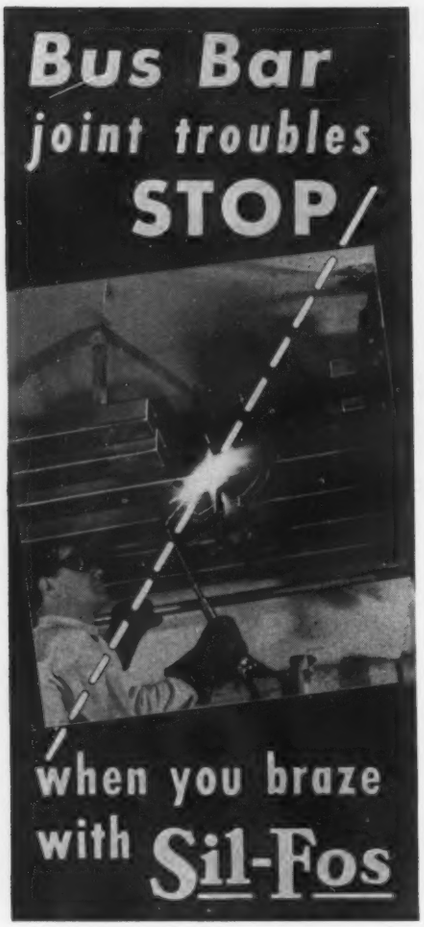
THE Chicago Surface Lines has developed a new method of breaking the bond between steel poles and the 6 feet of concrete they are anchored in . . . turning a tough job into a simple one requiring only a few minutes.

Four hydraulic jacks and a collar, and a central hydraulic pump, are mounted on an International I-14 Tractor. The tractor is driven up to the pole, the collar opened and the jacks lowered to the ground. The collar is then locked and wedges set between it and the pole. Pressure of approximately 160 tons can be built up by the hydraulic pump, although that much pressure is rarely needed. When the bond is broken, the unit is uncoupled and the tractor quickly driven to the next pole.

The collar has been used for some time with journal jacks. Four men manned the jacks but it was impossible to apply equal pressure all around. The International Tractor has permitted the use of a central hydraulic pump and the heavier-type hydraulic jacks, and has eliminated unloading and loading of the collar and jacks at each pole. It has made a compact, mobile combination that has materially reduced costs. This is typical of the jobs International tractors are called on to do. New uses for their versatility are turning up all the time. Ask the nearby International industrial power dealer or Company-owned branch for information on their ability to solve problems for you.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue **Chicago, Illinois**

INTERNATIONAL HARVESTER



ALL clamps, bolts, soft solder, drilling or punching of holes are eliminated. Sil-Fos joins copper bars permanently. In effect, you get a solid metal bus system.

Oxidation inside the joints is no longer a problem—there's no need for tightening, cleaning or servicing.

A Sil-Fos brazed system also is efficient. No extra resistance is set up in the circuit—joint conductivity is as high or higher than the copper bus itself.

And construction costs are less—copper can be saved and installation speeded up. Write us for full details. Ask for Bulletin 59-EW and our Bus Bar Reprint.

HANDY AND HARMAN
82 Fulton St.
New York, N. Y.
Agents in Principal Cities
HANDY & HARMAN of Canada, Ltd., Toronto

Field Reports on Business

Following the outbreak of hostilities in Europe, prices on the nation's security and commodity markets rose sharply, with considerable gains in the "war industry" stocks and staples. Non-ferrous metal markets advanced to new high levels for this year.

NEW YORK

In the face of troubles in Europe, which last week sent security prices on American exchanges gyrating, with sharp advances in metal and grain prices, business reports showed a steady rise in domestic activity. Last week carloadings were up 21 per cent, department store sales were somewhat above the usual seasonal rise and electrical appliance sales continued upward, with plans being made for new drives later in the fall.

Industrial leaders are taking stock of the European situation as it affects American production. It is believed that markets will not suffer as they did during the last war and that after some readjustment domestic business will show good increases. It is not expected that the war situation will seriously affect utility construction programs for the remainder of 1939 and for 1940. Power production continues at a high level, with prospects of new peaks being established this fall. New generating capacity is needed to meet the growing requirements.

Engineering awards, as reported by *Engineering News-Record*, show a 9 per cent gain above a week ago and 28 per cent above the corresponding 1939 week. So far this year awards are up 16.3 per cent over the same 1938 period.

The prospects of increased utility budgets for 1940 and further electrification of industry indicate that activity of electrical manufacturers will show considerable rise next year. On the basis of incoming orders a high rate of production should continue this fall.

NEW ENGLAND

Negotiations for electrical equipment and orders placed are now mounting weekly in this area and may be accounted for, in large measure, to government contracts allotted to this district. During the past few days the Riley Stoker Corp., Worcester, Mass., has been given a $379,863 contract for boilers and accessories for use in various navy yards. Portsmouth, N. H., navy yard is enlarging its facilities and a contract for an outside machine and pipe shop has been awarded to the New England Construction Co., New Haven, Conn., for $157,980, and the O. D. Purington Co., Providence, R. I., has received a contract for shop extensions at the Newport, R. I., torpedo station involving $106,156. Boston Insulated Wire & Cable Co. has received an order for cable from the government amounting to $30,705.

Machine makers are pressing for quick deliveries on orders for small motors and small switch and control equipment. According to representatives in this area, orders for from 5 to 50 lots of fractionals and from 1-hp. to 5-hp. motors are now being received at regular intervals. Pump motors are being priced for several institutional projects now being advertised.

A large volume of wiring for domestic service, together with fixtures and appliances, are in the offing, according to announcements of several large housing projects. Reports of industrial activity in Massachusetts recently released show an increase of nearly 15 per cent over a year ago for the month of July.

PACIFIC COAST

Despite steady though not marked advances in nearly all roughing-in material and an equally steady advance in building permit values up to July, wholesalers and manufacturers report cautious buying.

Rural electrification is an especial construction feature throughout the seven western states, and although in remote mountainous districts it may be considered seasonal, yet even in August it is apparently not yet at its peak. Recent allotments, whether by privately owned power companies, local co-operatives, or government award, include the following: A 900-hp. Diesel electric generating plant to serve 694 members is to be installed at Willcox, Ariz., and 270 miles of line built at a total cost of $500,000; $39,953 has been awarded for construction only of 26 miles of line and 47 small substations near Phoenix; a new award of $26,500 for 24 miles for 61 members additional to $301,000 for 294 miles for 838 members in Sun River District of Montana; $110,000 additional for 90 miles for 196 members near Missoula, Mont.; electric equipment for Brawley Diesel plant in Imperial Valley, and 53 miles of distribution line in Umatilla County, Ore.; Washington tops the list with 69 miles in Columbia County, 125 miles in Kittitas County and $535,000 for 511 miles serving 894 members in Spokane area.

All these installations will later provide excellent major appliance prospects.

CHICAGO

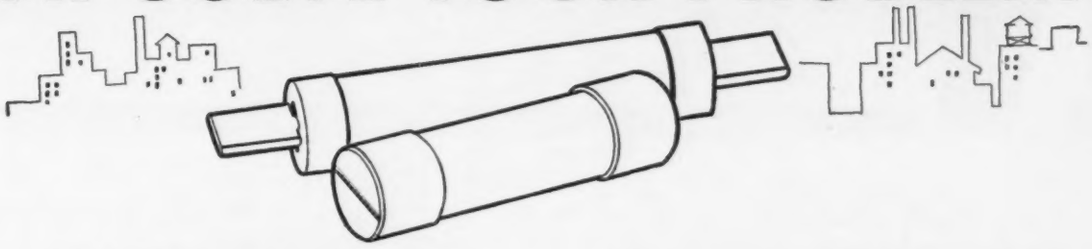
As a result of the uncertain conditions abroad, a note of caution was evident in several instances regarding commitments of sizable amounts. Otherwise, developments during the past week were, on the whole, distinctly favorable.

Increasing momentum in automobile production provided greater stimulation in the Middle West. Steel and electric power output showed moderate gains over the previous week. Retail trade was encouraging, the sales volume advancing above the preceding period. Wholesale markets, however, were somewhat sensitive to the ominous tone of foreign news. Purchasing of industrial equipment was a little more restricted, in some instances being confined to immediate needs.

Utility buying shows improvement as several expansion programs are getting under way. One municipal project nearby will involve an expenditure of approximately $1,000,000 for power plant equipment. The Chicago, North Shore & Milwaukee Railroad will spend $89,450 to modernize 25 coaches, including new electric heating and ventilating systems and lighting equipment.

Small motor sales are particularly good. Interest in fluorescent lighting equipment continues to increase. A large manufacturer of electric ranges reports sales substantially ahead of last year.

If you have "Alibi" Shutdowns in your plant... BUSS FUSES MAY SOLVE YOUR PROBLEM



"Alibi" shutdowns is a name that can be aptly applied to shutdowns blamed on plant or operating conditions INSTEAD OF ON PLANT EQUIPMENT.

For example, when fuses blow needlessly—because of the development of poor contact within the fuse itself—IT'S JUST AN ALIBI TO BLAME conditions—when FUSES THAT PROTECT BUT DO NOT OPEN NEEDLESSLY are available.

Why should any operating executive accept as a necessary evil useless shutdowns that cost so much in time and money when—as far as fuses are concerned—they can be practically wiped out?

Investigate the shutdowns in your plant

Maybe right in your own plant you are suffering from useless shutdowns.

If you are and somebody blames them on fuses—that's the time to do some careful checking.

The chances are that BUSS Super-Lag fuses will solve your problem. BUSS Fuse-Cases are so made that they prevent the development of poor contact within the fuse—and BUSS Fuse-Links have super-long time-lag that permits them to hold on without blowing when harmless overloads occur.

Thus BUSS fuses help eliminate the two greatest causes of protective devices opening needlessly.

Get this book on
"How to Select Renewable Fuses"

Write for a free copy. You will find it unusually interesting as it compares various types of fuse construction and shows how the BUSS fuse is made to protect—but not to blow needlessly. BUSSMANN MFG. CO., University at Jefferson, St. Louis. Division McGraw Electric Company.

KELLY

WHY BUSS FUSES DON'T BLOW NEEDLESSLY

10 FEATURES in the design of the FUSE-CASE help make it possible..

The **SUPER-LAG** development in the FUSE-LINK completes the job.

BUSS 1914 Silver Anniversary 1939 25 years progress in Fuses

NEWS ABOUT PEOPLE

William H. Wade Assumes Broad Executive Duties

William H. Wade, commercial vice-president of the Pennsylvania Edison Co., Altoona, has been made vice-president and assistant general manager. Mr. Wade has been identified with the Altoona utility for the past 25 years. Announcement of his promotion was made by J. Harry Shearer, president and general manager of the company, who said that the appointment was made upon his recommendations to the board of directors at its recent meeting in New York City. The appointment became effective at once.

All personnel in the department formerly in charge of the late Benjamin F. Cleaves, which included power plants, transmission, distribution, utilization, construction and engineering, both in electric and gas service, and

also coal mining, now come under the jurisdiction of Mr. Wade.

Immediately after graduation in electrical engineering from the University of Pennsylvania, Mr. Wade joined the staff of Day & Zimmermann. In 1918 he was made new-business manager for what was then the Penn Central Light & Power Co., which was the outgrowth of the development of the Day & Zimmermann organization.

In 1932 he became vice-president in charge of commercial operations, rates and merchandising. He still retains his title as vice-president of the company along with the new position of assistant general manager. Mr. Wade is a past-president of the Pennsylvania Electric Association.

•

▶ R. M. PHELPS, formerly manager of merchandise sales of the Pennsylvania Edison Co., Altoona, has been placed in charge of the new merchandise department. The merchandise department was until recently a division of the new business department.

▶ R. T. BUCKNER, who has been connected with the Duke Power Co., at Gastonia, N. C., has been made manager of the Belmont branch of the Gastonia district. Before joining the Duke Power Co., some years ago, Mr. Buckner had been engaged in the electrical contracting business.

▶ FRANK SNYDER, member of the sales force of the Winston-Salem branch of the Duke Power Co. since 1926, has been promoted to the position of sales manager of that branch to succeed the late Paul Linville. Mr. Snyder is a native of Spartanburg, S. C., and a graduate of Wofford College.

▶ LAWRENCE E. JOSEPH has been appointed as executive officer in charge of the Blaw-Knox division of the Blaw-Knox Co. Mr. Joseph succeeds R. F. McCloskey, Sr., a company vice-president, who was placed in charge of the development of new products for the entire corporation. Mr. Joseph was formerly manager of the National Automatic Tool Co., Richmond, Ind. Prior to that connection he was a vice-president of the Liggett Spring & Axle Co., and previously was engaged as a consulting engineer.

R. W. McClure New Head Of Kansas Electric Power

R. W. McClure, who has assumed the duties of president of the Kansas Electric Power Co., Lawrence, Kan., as announced recently in the ELECTRICAL

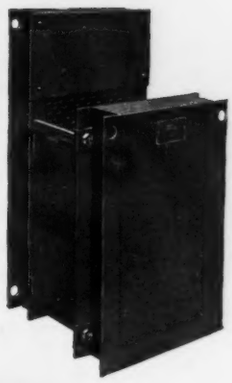
WORLD, is a native of Missouri and a graduate of the University of Missouri.

Entering the public utility business in 1921 with the Southwestern Power Co. at Lawton, Okla., Mr. McClure became vice-president of the company in 1928 and occupied that executive office until 1936. In that year he was made president of the Oklahoma Power & Water Co., with headquarters at Sand Springs, the position from which he resigned to accept the presidency of the Kansas Electric Power Co.

•

▶ LINCOLN F. SCHAUB has been elected a member of the board of directors of the Associated Gas & Electric Co., to fill the vacancy created in July by the resignation of Francis P. Cummings. A consultant on corporate finance, Mr. Schaub has been associated with the Walter J. Salmon realty firm in New York since 1925. He was admitted to the Massachusetts Bar in 1906 after

AmerTran single-phase, air-cooled transformers. Left: Type CF weatherproof type. Below: Type WF for indoor service only.



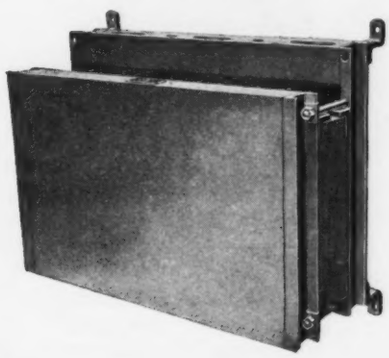
ECONOMICAL

for all lighting and small power loads

Whenever it is desired to obtain a low-voltage supply from a higher voltage power circuit, you will find AmerTran air-cooled transformers both inexpensive and convenient to use. They may be installed where needed—either indoors or outdoors*—without the necessity of oil, fireproof vaults or enclosures. Let us show you how these units will reduce your installation, maintenance and operating expenses. Send for Bulletin No. 1116A describing standard sizes rated 50 Kva. and smaller, 2400 volts and below

* Units rated 20 Kva. and larger for indoor service only.

AmerTran three-phase, air-cooled transformers. Above: Type CFT weatherproof type. Below: Type WFT for indoor service only.



Above: AmerTran Type CFP phase-changing transformer for either indoor or outdoor installation.

AMERICAN TRANSFORMER COMPANY

178 Emmet St., Newark, N. J.

AMERTRAN TRANSFORMERS

Manufactured Since 1901 at Newark, N. J.

NATIONAL PRESSURE CONNECTORS

FOR EVERY REQUIREMENT

CATALOG SENT UPON REQUEST

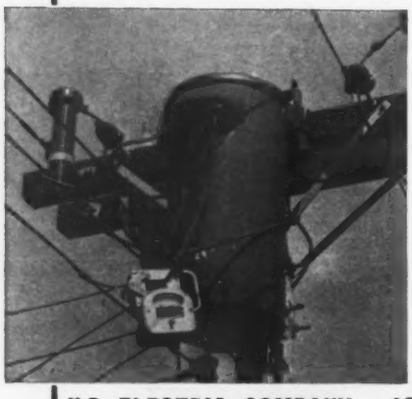
National Electric Products Corporation

Pittsburgh, Pa.

Offices in Every Principal City

DISCARD HIGH COST METHODS OF CHECKING TRANSFORMER LOADING..

Install the HD MAX-I-METER



—cuts costs more than half

Tests show that the actual cost per transformer checked by H D Max-I-Meters is less than that of any other method. That is why more and more operating companies are standardizing on H D MAX-I-METERS. They know they are dependable and save money. They take less time to install—their cost is low—they are sturdily built and can stand hard usage. Ready for instant use—no support necessary, simply clamp the MAX-I-METER over one of the transformer leads and let it hang as long as you want the test to run—a day—a week—a month. Know for certain the load your transformers are carrying. Get a H D MAX-I-METER today and find out how it can save money for you.

H D ELECTRIC COMPANY 100 W. MONROE ST., CHICAGO, ILL.

The illustration above shows a MAX-I-METER on the secondary side of a distribution transformer.

HD MAX-I-METER

graduation from Harvard Law School and practiced in Boston. He was lecturer at Harvard Law School and later professor of commercial law at the Harvard Graduate School of Business Administration. He was acting dean of the business school during 1918 and 1919.

▶ THOMAS R. DOBSON, formerly manager of power sales for the Pennsylvania Edison Co., Altoona, has been appointed manager of the new business department, both gas and electric.

•

Wiremold Appoints Strang Lighting Division Head

Announcement has been made by D. Hayes Murphy, president of the Wiremold Co., Hartford, Conn., of the organization of a lighting division, with Perry S. Strang as manager. Lighting equipment within the scope of the company's established products will be developed in continued close co-operation with related branches of the electrical industry.

Mr. Strang, formerly of Chicago and more recently of Allentown, Pa., is well known in the lighting industry, his background of 25 years giving him a wide experience in this field. Mr. Strang has taken up his residence in Hartford, where he will carry on his new duties at Wiremold headquarters.

OBITUARY

▶ PAUL LINVILLE, for more than 25 years a member of the Duke Power Co. organization and for the past several years commercial manager of the Winston-Salem district, died in that city on July 21. He was 42 years of age.

▶ THOMAS E. MADDEX, electrical engineer for the Central Illinois Public Service Co., Springfield, Ill., died on August 8, of injuries received in an automobile accident. Mr. Maddex had been an employee of the Central Illinois Public Service Co. since 1919.

80,000,000 Hp. Water Power Seen Possible

Estimates of the potential water power in the United States have been published by the Geological Survey, Department of the Interior, at intervals since 1908, the last preceding estimate having been released in 1936. The Survey has just issued a revised estimate which shows the horsepower at 70 per cent efficiency estimated to be available 90 and 50 per cent of the time with possible future storage.

The tabulation, which is given by states, here summarized by regions,

Potential Water Power Available

(In horsepower — with storage, 70 per cent efficiency; gross head)

Division	90% of the Time	50% of the Time
United States	42,901,000	57,412,000
New England	988,000	1,541,000
Middle Atlantic	4,895,000	6,242,000
East No. Central	869,000	1,640,000
West No. Central	1,193,000	1,885,000
South Atlantic	2,936,000	4,058,000
East So. Central	2,620,000	3,761,000
West So. Central	785,000	1 005,000
Mountain	10,740,000	13,072,000
Pacific	17,875,000	24,108,000

shows 57,412,000 hp. available 50 per cent of the time. The installed capacity, if this power were fully developed, would be considerably larger—probably 80,000,000 hp. or more, the report states.

To conform to tentative international standards the potential water power in kilowatts at 100 per cent efficiency is also reported for various conditions. Based on water available 95 per cent of the time under existing conditions the total for the country is 25,043,000 kw.; for 50 per cent of the time it is 53,997,000 kw.; on the arithmetical mean flow it is 82,499,000 kw.

•

Launch Adequate Wiring Program in St. Louis

The Adequate Wiring Bureau of the St. Louis Electrical Board of Trade has set up a comprehensive and continuing plan of adequate wiring promotion aimed at the new home field. This promotion will enlist the co-operation of architects, responsible financing agencies and the building industry, through the recently organized Supervised Home Service Construction.

Union Electric Co. has taken a substantial membership in the organization on condition that the plans for every home included in the operation of this group shall include adequate wiring in accordance with the standards of the National Adequate Wiring Bureau. This condition has been agreed to.

USE

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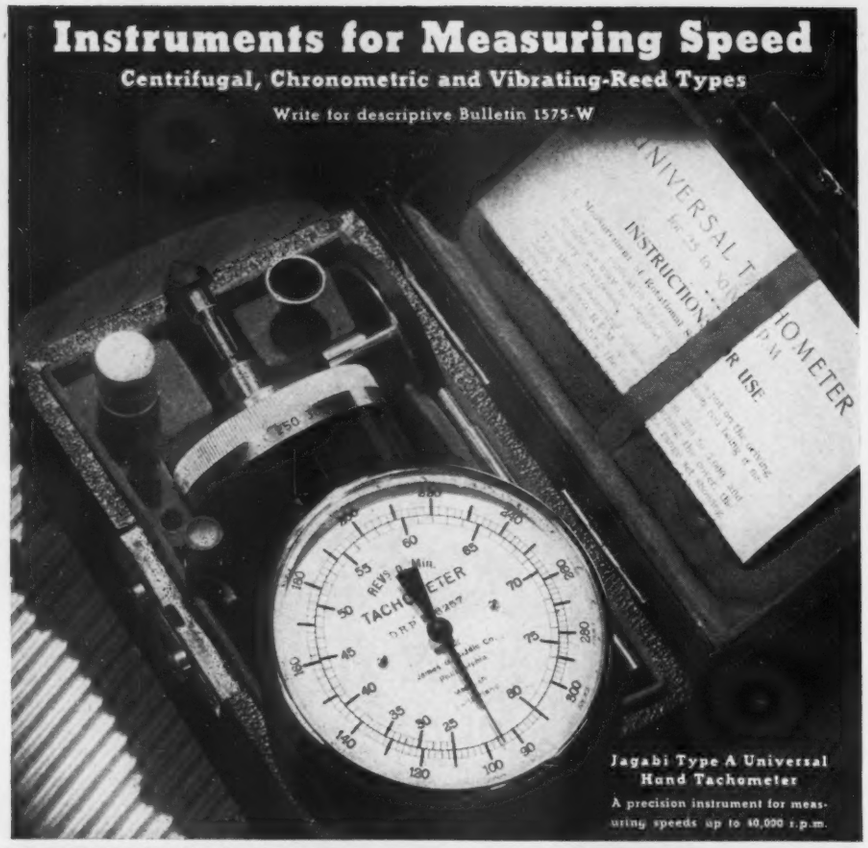
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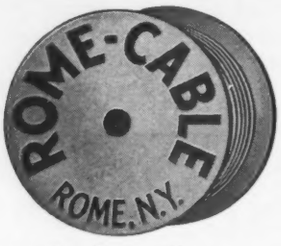

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Recent Rate Changes

CONSOLIDATED GAS, ELECTRIC LIGHT & POWER CO. of Baltimore electric rate schedules will be reduced approximately $1,000,000 annually through negotiations conducted by Joseph Sherbow, People's counsel, and the Maryland Public Service Commission, Gov. Herbert O'Conor has announced. Effective after November 1 meter readings, the cut is the biggest ever obtained through negotiations without formal rate hearings. Almost all the saving to consumers will be applicable to electric rates, with possibly some small part going to gas consumers. The cut in electric rates will go mostly to residential consumers and to Baltimore city for municipal consumption. Mr. Sherbow said in his report to Governor O'Conor that the Consolidated will not absorb this entire rate reduction itself, as a substantial part is coming from Pennsylvania Water & Power Co., which is revising its power contract with Consolidated. As a result, the Consolidated will pay less for its power, and this saving is being passed on to the consumers. The Maryland Public Service Commission has approved the reduction.

UTAH POWER & LIGHT CO. has been ordered by the Public Utilities Commissions of Utah and Idaho to reduce its electric rates approximately $250,000 per year, effective September 1. Communities affected include Salt Lake City, Ogden and Provo, Utah, and approximately 320 smaller towns on the company's interconnected system in Utah and Idaho. Minimum monthly bills to residential, farm and commercial lighting customers were reduced from 90 cents to 75 cents, the top residential and farm rate cut from 5 cents per kilowatt-hour to 4 cents, and adjustments made in other steps of the commercial lighting schedule. The Utah commission stated that it was its opinion that further reductions could be made now because annual revenues had increased due to increased use of electricity. G. M. Gadsby, president of the company, gave entire credit for this recovery of revenue to a consistent program of sales promotion, pointing out that while consumers were receptive to lower rates it took a planned program of selling to convert this into actual increased use of electrical service. Rate reductions on the company's system during the past five years were estimated to have brought total savings of more than $1,000,000 annually to the company's customers.

PACIFIC GAS & ELECTRIC CO. has reduced its rates in 18 unincorporated towns and 28 built-up areas adjacent to cities served by it. The new schedule saves 40,000 electric customers $250,000 a year. This was the last block of reductions in the $3,200,000 cut announced in July. Defining what areas outside cities—midway territory between rural and urban—should be included in the new schedules was a job which kept engineers for P. G. & E. and the California Railroad Commission busy for eighteen months. Savings to domestic and commercial customers will average between 9.6 and 15.9 per cent. Charges will be as follows for the indicated usages per month: 15 kw.-hr., $1.22; 35 kw.-hr., $2.04; 50 kw.-hr., $2.44; 100 kw.-hr., $3.79. Minimum charge remains unchanged at 60 cents per month.

WEST COAST POWER CO.'s rate reductions for domestic and commercial business in the Grant County division in central Oregon and the western division,

"We'll be glad to come"

Every day, the telephone brings happiness and cheer to many a home. Some one thinks of some one, reaches for the telephone, and all is well.

Telephone service is exceptionally good in this country—and it's cheap. Nowhere else do people get so much service, and such good and courteous service, at such low cost.

BELL TELEPHONE SYSTEM

The Bell System cordially invites you to visit its exhibits at the New York World's Fair and the Golden Gate International Exposition, San Francisco

SENIOR LUMINAIRE
Design #31S

DauntLuminaires

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MODERN LIGHTING REQUIREMENTS

by giving 30% MORE LIGHT

Examination of light distribution charts for the DAUNT Luminaires show that 68% is below the horizontal, assuring maximum useful illumination as 60% lies within the zone of 50 to 80 degrees.

30,000 DAUNT Luminaires light the sidewalks of New York, and the highways to the World's Fair.

The advanced design features of the SENIOR and JUNIOR LUMINAIRES combine minimum maintenance cost with maximum utility and beauty.

ARISTO-LITE — the latest unit which features lighting value with smart new elegance, and has the exclusive features of the Senior and Junior Luminaires.

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A CROSSETT WATZEK GATES INDUSTRY

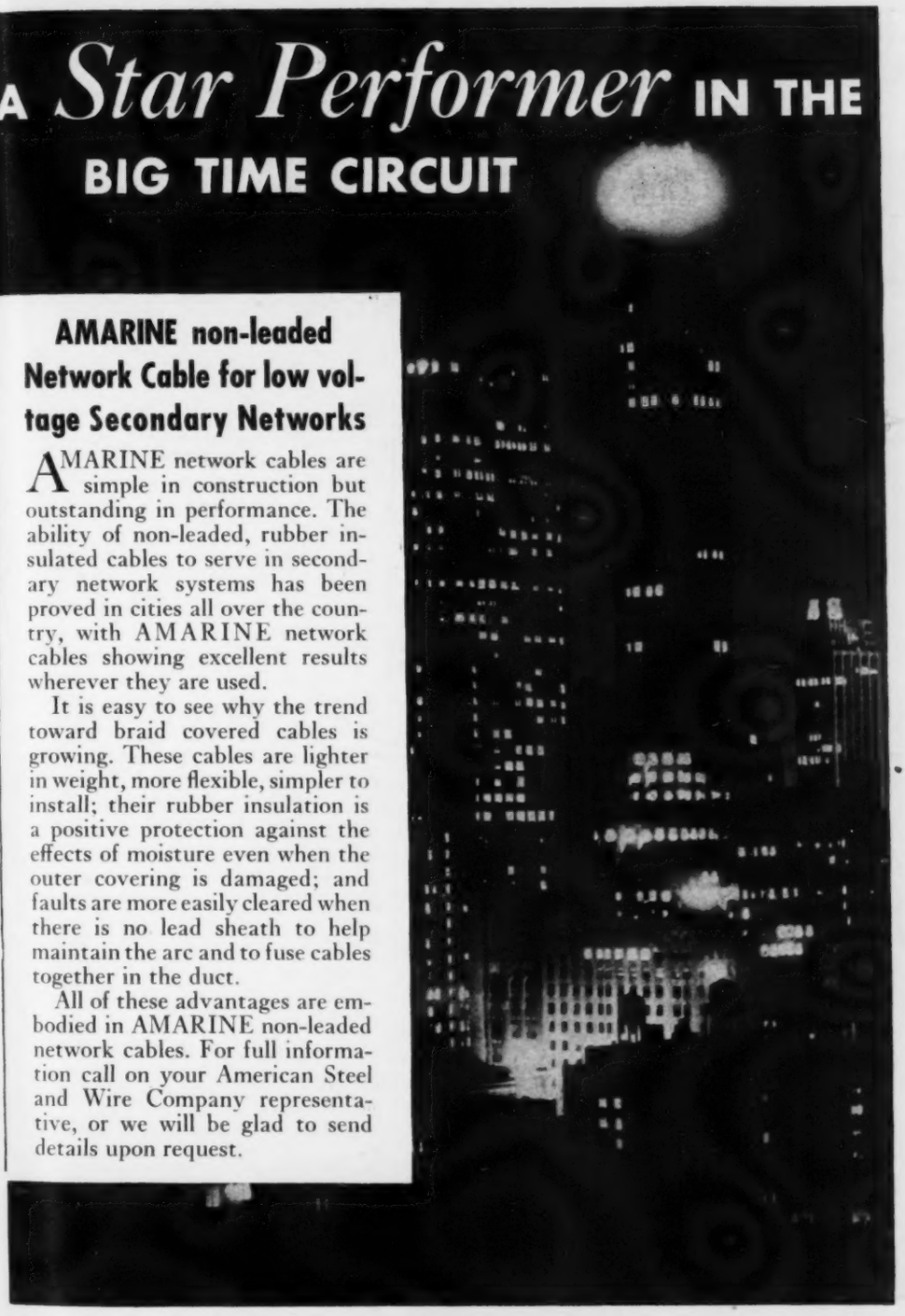
along the Oregon coast, have been authorized by the Public Utilities Commissioner of Oregon, effective September 15. The reductions will save the company's customers approximately $2,000 in the Grant County area—Canyon City, Prairie City and John Day—and about $20,000 in the coast area including Waldport, Yachats, Florence and Reedsport. In both areas the reduction amounts to approximately 10 per cent. In central Oregon the new rates, both domestic and commercial, start at 8 cents and drop to 2 cecnts. In the coast area, the top step is 7 cents and the bottom step, 2 cents.

NEW MEXICO POWER CO.'s proposal to reduce its electric rates in Santa Fe in return for a waiver of the city's rights to demand further rate reduction before 1945 has been accepted by the City Council. Council members estimated the reduction would save Santa Fe consumers approximately $43,000 annually. Largest saving under the new rates, which went into effect on September 1, were in domestic and residential rates, where the saving was estimated at $22,000. The new residential rates will be 7 cents a kilowatt-hour for the first 30 kw.-hr. and 6 cents a kilowatt-hour for the next 30 kw.-hr., with corresponding reductions as more electricity is used. The old rates were 10 cents a kilowatt-hour for the first 25 kw.-hr. and 7 cents per kilowatt-hour for the next 20 kw.-hr. An estimated annual saving of $18,000 is expected to be made under new business and commercial rates. They are: 7 cents per kilowatt-hour for the first 200 kw.-hr.; 6 cents per kilowatt-hour for the next 300, compared with the old rates of 9 cents per kilowatt-hour for the first 200 kw.-hr. and 7 cents per kilowatt-hour for the next 300 kw.-hr.

DAKOTA PUBLIC SERVICE CO. has been ordered by the North Dakota Railroad Commission to make reductions in electric power rates, affecting 35 slope communities in North Dakota and to refund payments totaling approximately $35,000 to residential light users in Bismarck, Mandan and Dickinson. The order reduces the cost of residential service in the three cities from 7 to 6¼ cents per kilowatt-hour for the first 30 kw.-hr. used monthly, effective September 1. It also reduces the cost of commercial service in the three cities from 7 to 6¼ cents per kilowatt-hour for the first 100 kw.-hr. used monthly. No other changes were ordered in the commercial service division. Rates of 5 and 3 cents per kilowatt-hour for the next 30 and 60 kw.-hr., respectively, were unchanged in residential service, but the rate for all additional use was reduced from 2¼ to 2 cents, applicable in all 35 communities, comprising A-B-C towns. Elmer Cart, commission president, said the refunds ordered from the start of the investigation APRIL 1, 1936, apply only to residential light users in the three major towns and not to commercial users in those cities. He also asserted refunds are ordered for residential customers, using 30 kw.-hr. monthly, at the rate of 15 cents monthly, or a total of $6.15 to each customer for the period. About 5,200 customers are eligible for rebates.

COLUMBUS & SOUTHERN OHIO ELECTRIC CO. has been authorized by the state Public Utilities Commission to file a new schedule of tariffs for electric services in seven central Ohio cities, amounting to a one-cent per kilowatt-hour reduction for service in excess of 200 kw.-hr. per month for residential consumption. The new tariff schedule will not affect the present rates being charged in the Columbus area. The new rate reduced from 3 cents to 2 cents

A *Star Performer* IN THE BIG TIME CIRCUIT



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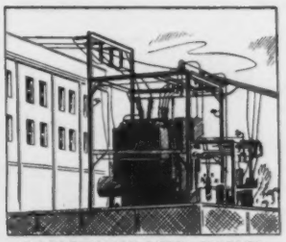
AMARINE network cables are simple in construction but outstanding in performance. The ability of non-leaded, rubber insulated cables to serve in secondary network systems has been proved in cities all over the country, with AMARINE network cables showing excellent results wherever they are used.

It is easy to see why the trend toward braid covered cables is growing. These cables are lighter in weight, more flexible, simpler to install; their rubber insulation is a positive protection against the effects of moisture even when the outer covering is damaged; and faults are more easily cleared when there is no lead sheath to help maintain the arc and to fuse cables together in the duct.

All of these advantages are embodied in AMARINE non-leaded network cables. For full information call on your American Steel and Wire Company representative, or we will be glad to send details upon request.



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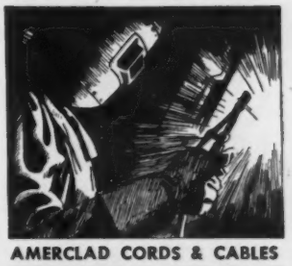

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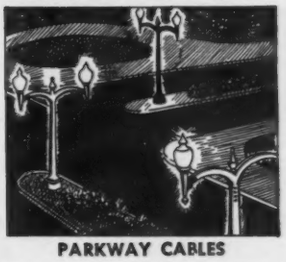

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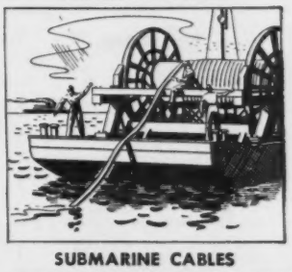

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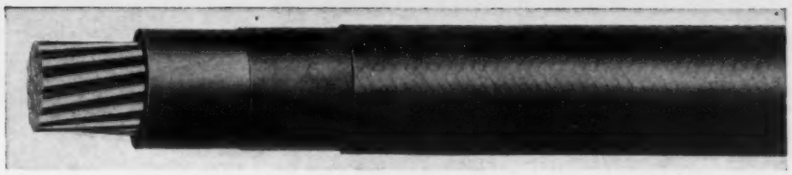

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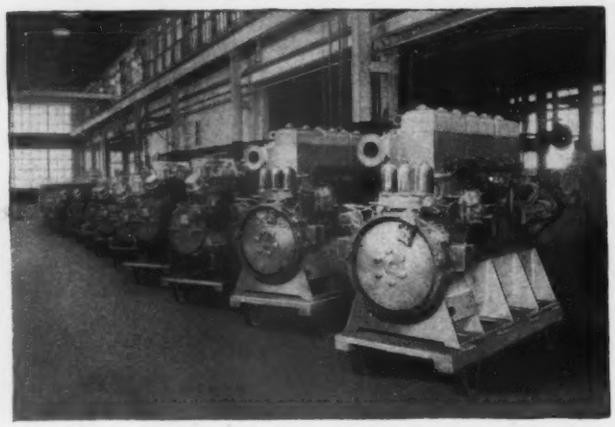

Two 6-cylinder 425 H.P. 1200 R.P.M.—Ten 6-cylinder 180 H.P. 1200 R.P.M. Sterling engines being assembled for Springfield Sewage Pumping Stations.

● That all may read and be informed—for 20 years Sterling, exclusively, has been advertising descriptions of standby power installations, advancing these installations and their correct engineering. Always building greater value, refining and developing. Losing awards at times because of a slight difference in cost, where specifications admitted only of horsepower ratings and low price. Never deviating in quality or effort.

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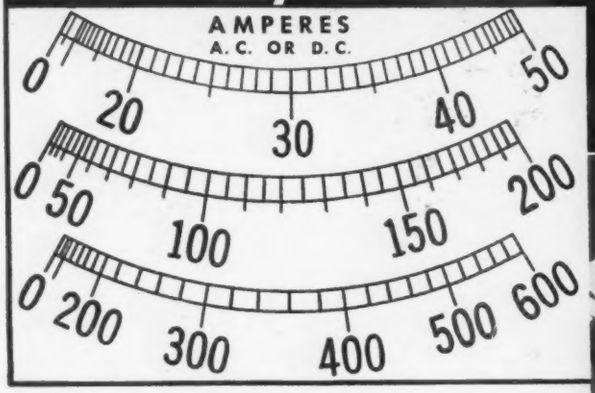

A typical combination of ranges furnished with the Type AX Tong Test are shown at the left.

Tong Test Ammeters are more quickly and accurately read because each of the ten scale ranges available has only one set of large numerals and each is a separate, hand-calibrated unit. Shown above actual size, these scale ranges are instantly interchangeable and one instrument can be furnished with one or more of the several scales which exactly meet your operating conditions.

Tong Test is the only ammeter of this type having these easily-read scale ranges; the only one which can not burn out or be damaged electrically; the only one which measures both A.C. and D.C.

Tong Tests measure up to 1,000 amperes. May we send you a bulletin describing them or arrange a demonstration?

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TONG TEST AMMETERS

the rates for residential use in Athens, Gallipolis, Hillsboro, Seaman, Jackson, Middleport, and Nelsonville; and for a one-cent reduction for the first 30 kw.-hr. for residential consumers and for the first 50 kw.-hr. for commercial rates outside of Delaware.

●

August Allotments Announced by REA

Announcement has been made by the Rural Electrification Administration of new allotments totaling $478,000. This brings allotments made by REA since it was established in 1935 to $241,715,293.

Among the allotments made in August are the following:

TEXAS—Jackson Electric Co-operative, Inc., Edna, Tex., A. L. Burditt, president, $149,000 to build 180 miles of line, 535 members in Jackson, Matagorda and Calhoun counties.

ARKANSAS—First Electric Co-operative Corp., Jacksonville, Ben Marshall, supt., $327,000 to build 395 miles of line, 1,338 members in Lonoke, White, Cleburne, Prairie, Pulaski and Perry Counties.

GEORGIA—Ocmulgee Electric Membership Corp., Dublin, J. L. Allen, president, $188,000 to build 226 miles of line, 990 members in Laurens, Wilkinson, Bleckley and Twiggs counties.

INDIANA—Tipmont Rural Electric Membership Corp., Linden, Cerl H. Hiatt, supt., $480,000 to build 510 miles of line, 1,673 members in Fountain, Tippecanoe, Montgomery and Clinton counties. White County Rural Electric Membership Corp., Monticello, Ralph H. Mahin, president, $446,000 to build 450 miles of line, 1,398 members in White, Pulaski, Benton and Jasper counties. Kankakee Valley Rural Electric Membership Corp., Wanatah, Arnold H. Christianson, supt., $445,000 to build 461 miles of line, 1,454 members in Porter, Starke, St Joseph, LaPorte and Pulaski counties.

MINNESOTA—Northern Electric Co-operative Assn., Virginia, Gust Ardin, president, $315,000 to build 277 miles of line, 1,103 members in St. Louis County.

OKLAHOMA—Southwest Rural Electric Co-operative, Tipton, Tom Moran, supt., $138,000 to build 156 miles of line, 431 members in Jackson, Kiowa, Tillman Counties (Okla.) and Wilbarger and Foard counties (Tex.).

WISCONSIN—Crawford Electric Co-operative, Gays Mills, C. H. Hooverson, supt., $138,000 to build 141 miles of line, 382 members in Crawford and Vernon counties.

MISSISSIPPI—Central Mississippi Electric Power Assn., Carthage, E. T. Thomas, supt., $63,000 to build 68 miles of line, 245 members in Leake, Neshoba, Newton, Attala and Rankin counties.

WASHINGTON—Columbia County Rural Electric Assn., Inc., Dayton, Grace A. Mead, president, $77,000 to build 69 miles of line, 105 members in Columbia County.

NEBRASKA—Dawson County Public Power District, Lexington, Thomas C. Guilfoyle, supt., $69,000 to convert about 100 miles of line, previously planned for single-phase to 3-phase so that they will be able to provide ample power for irrigation pump motors.

TENNESSEE—City of Knoxville, $81,000

COMPLETE SPECIFICATIONS on the Hilldale branch line extension had to be in Purchasing Department's hands by 4 p.m. Monday, so Bill and I worked over the weekend.

Sunday afternoon, with all our calculations finished and ready to draw up the specifications, the Chief Engineer phoned us that plans had to be changed so as to use *glass* insulators.

When we realized this was Sunday, "We're sunk," said Bill. But we weren't, because I remembered the blue-and-orange Electrical Buyers Reference. It was a cinch to compare the catalog data of several leading insulator manufacturers and find all the product information we needed.

By noon Monday the P.A. had the complete specifications, and we breathed easy again.

★ ★ ★ ★ ★

YOU'LL SAVE TIME AND MONEY by looking in Electrical Buyers Reference — first. It cuts out all guesswork as to where to look to find the products you want — in a hurry. No juggling and thumbing through dozens of catalogs. In one handy volume you have data on thousands of products made by hundreds of manufacturers . . . instantly, accurately.

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...we'll never get these specifications together in time!"

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STOP *Tearing Up Lawns and Pavements!*

This Greenlee Pusher has capacity for pipe up to 4-inch and is provided with six operating speeds. A somewhat similar pusher for larger pipe, drainage ducts, etc., is also available.

INSTALL PIPE WITH THE

GREENLEE *Hydraulic* **PIPE PUSHER**

Let Us Send Complete Details

It isn't necessary to damage lawns and pavements by trenching in order to install pipe under ground, and it isn't necessary to go to the expense of digging and back-filling. The Greenlee Hyraulic Pusher requires a trench only long enough for the pushing operation, and one man, standing in a comfortable position, can push the pipe where it is wanted, simply by pumping the handles.

This tool is compact, easy to handle and simple to operate. Pumping the handles sets up hydraulic pressure, causing the body of the pusher to travel on the notched steel base and push the pipe through the ground. The pipe clamp is reset only when the end of the base is reached.

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

to build 66 miles of line, 542 members in Knox, Blount and Sevier counties.

VIRGINIA—Northern Piedmont Electric Co-operative, Madison, T. A. Jeffries, supt., $77,000 to build 78 miles of line, 225 members in Culpepper and Fauquier counties.

KANSAS—Sekan Electric Co-operative Assn., Inc., E. F. Schrimsher, supt., Girard, $220,000 to build 212 miles of line, 602 members in Crawford and Bourbon counties.

MINNESOTA — Kandiyohi Co-operative Electric Power Assn., J. Mauritz Nelson, supt., Willmar, $275,000 to build 314 miles of line, 785 members in Kandiyohi, Chippewa, and Swift counties.

MONTANA—Missoula County Electrification Assn., Gordon Trenary, mgr., Missoula, $110,000 to build 90 miles of line, 196 members in Missoula, Granite and Powell counties.

FLORIDA—Escambia River Electric Co-operative, Inc., P. S. Wiggins, president, Pensacola, $180,000 to build 210 miles of line, 753 members in Escambia and Santa Rosa counties.

SOUTH DAKOTA—Sioux Valley Electric Assn., Inc., E. G. Sanderson, president, Brookings, $356,000 to build 355 miles of line, 831 members in Brookings, Lake and Kingsbury counties. Sioux Empire Electric Assn., Inc., L. W. Ellefson, president, Sioux Falls, $390,000 to build 365 miles of line, 919 members in Minnehaha and Lake counties.

TEXAS—Lower Colorado River Electric Co-operative, Inc., C. W. McEachern, president, Austin, $605,000 to build 825 miles of line, 2,125 members in Lee, Washington, Williamson, Travis, Bastrop, Fayette, Austin, Caldwell and Guadalupe counties.

WASHINGTON — Inland Empire Rural Electrification, Inc., Glenn H. Bell, supt., Spokane, $535,000 to build 511 miles of line, 894 members in Whitman, Garfield and Spokane counties.

•

SEC Permits Assets Sale by Traction Light Co.

Securities and Exchange Commission has issued an order permitting Traction Light & Power Co., a subsidiary of the trustee of Midland United Co., to sell all of its utility assets to Central Indiana Power Co. and Public Service Co. of Indiana.

The aggregate price was placed at $602,000, of which $475,000 is to be paid by Central Indiana Power Co. and $127,000 by Public Service Co. of Indiana for those portions of Traction Light & Power Co. assets which each is to acquire.

•

Board Approves New Loans

Public Service Commission approval of the petition of the Northern Indiana Public Service Co. to refund its bonds has been announced. The commission granted authority to the utility to issue $45,000,000 in new bonds and $6,000,000 in serial notes or debentures, the proceeds to be used to retire outstanding bonds.

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Entirely revised, up-to-date, and containing many new data which make this Directory better than ever for your engineering, statistical or sales purposes . . .

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Plant Equipment and Operating Data—The Central Station Directory lists for every plant its total generating capacity; the types and capacities of all prime movers and generating units; the voltages, phases, cycles and wiring of the distribution system; total number of meters connected, etc.

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OLIVER IRON AND STEEL CORPORATION
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APPROVED AND ACCEPTED SINCE 1894

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PENOTE SECTIONAL STEEL MANHOLE FORMS

Built of Husky Steel they are INDESTRUCTIBLE—Require no Skilled Labor—Are Quickly and Easily Installed and Removed—Are Flexible and Interchangeable—Permit Pouring Manhole Complete in ONE OPERATION—INITIAL COST LOW—NO MAINTENANCE EXPENSE.

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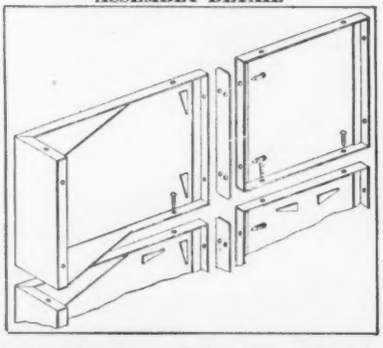


These are but a few of the many advantages to be secured by the use of these patented sectional steel forms—there are many others.

Penote Forms are equally efficient in rebuilding and in sheathing excavations. Send us a list of your requirements—we'll gladly tell you what is needed—quote you and gladly allow you to try a set of forms on approval—No obligation—Write today.

THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Ave., Cleveland, Ohio

Sales Opportunities

YOUNGSTOWN, OHIO—United Engineering & Foundry Co., First National Bank Building, Pittsburgh, Pa., plans installation of motors and controls, conveyors, electric hoists and other equipment in new additions to heavy machinery manufacturing works at Youngstown. Work will begin in September. Cost estimated about $300,000.

DENVER, COLO.—State Department of Buildings, State House, has taken out a permit to construct a new steam-electric power plant at 1341 Sherman Street, two-story type, 87 x 125 feet, to be used for State buildings. Cost about $145.000. Work scheduled to proceed at once. Gordon D. White, 615 Columbine Street, Denver, is architect.

NEWKIRK, OKLA.—Commissioner of Public Utilities plans extensions and improvements in municipal power plant, with installation of additional equipment. Work will include additions to transformer room, with installation of four new transformers and accessories.

WASHINGTON, D. C.—Potomac Electric Power Co. has asked bids for structural steel framing for proposed addition to steam-electric generating station at Benning and will begin erection early in the fall. As previously announced additional equipment will be installed for increased capacity.

NORFOLK, NEB.—Loup River Public Power District, 2037 Thirteenth Street, Columbus, Neb., Harold Kramer, secretary, has authorized new transmission line from Norfolk to Winside and vicinity, totaling about 15 miles, for which bids will be asked at once. Also, at same time, bids for extensions in number of power substations and installation of equipment, as well as for installation of secondary lines at Winside and other communities in that area. Harza Engineering Company, 205 West Wacker Drive, Chicago, Ill., is consulting engineer.

HAWTHORNE, CALIF.—Northrop Aircraft, Inc., Acadia and 126th Streets, plans installation of motors and controls, transformers and accessories, conveyors, electric hoists and other equipment in new one-story airplane-manufacturing plant, about 100,000 square feet of floor space, forming initial unit of new works at 120th Street and Crenshaw Boulevard, Hawthorne, where tract of about 72 acres of land has been acquired. Cost close to $200,000. Proposed to begin work soon. B. G. Reed is company engineer.

VANCOUVER, WASH.—Administrator, Bonneville Project, 811 N. E. Oregon Street, Portland, Ore., receives bids until September 13 for construction of a 230-kv., single-circuit, steel tower transmission line between North Vancouver, where switching station will be located, to Kelso, Wash., and vicinity, about 41 miles (Circular 295).

QUANTICO, VA.—Bureau of Yards and Docks, Navy Department, Washington, D. C., receives bids (no closing date stated) for equipment for power plant at Marine Barracks, Quantico, including boiler units, oil and gas burners, boiler feed pumps, feed water heater and storage tank, fuel oil tanks, fuel oil pumping set and complete auxiliary equipment (Specifications 9343).

CAMDEN, ARK.—Ouachita Rural Electric Corporation, Camden, has plans nearing completion for new power substation on Mount Holly Highway, near Camden, where

site has been selected. Cost about $126,000, with transformers, switchgear and other operating equipment. Extensions will be made in transmission lines for connection of station with system. Financing has been arranged.

GLENDALE, CALIF.—City Council receives bids until September 14 for two steam-generating units and auxiliary equipment for installation in municipal power plant, each unit to have a rated capacity of 200,000 pounds of steam per hour, and provided with boiler superheater, air heater, burners and complete accessories, all as per Specifications 203-A, on file at office of superintendent of Public Service Department.

WESTMONT, ILL.—Western United Gas & Electric Co., Aurora, Ill., has asked bids for erection of new indoor-type power substation at Westmont, and will begin work on unit in September. Transmission line extensions will be made for connection with high-tension system in that district. Frank B. Gray, 73 South LaSalle Street, Aurora, is architect.

KNOXVILLE, TENN.—Electric Power and Water Board, Max Bartlett, manager, plans extensions in primary and secondary lines in different parts of city. Cost about $81,000. Financing has been arranged through federal aid. Work will be carried out in fall.

FORT MADISON, IOWA—State Board of Control, Capitol Building, Des Moines, Iowa, has plans maturing and will take bids soon for new power plant at State institution at Fort Madison. Cost estimated about $170,000. H. J. Liebbe, Des Moines, is state architect.

VIENNA, MD.—Delmarva Power Co., Vienna, a subsidiary of Eastern Shore Public Service Co., Salisbury, Md., has plans under way for new steam-electric generating plant on local site. Cost estimated close to $1,000,000, including extensions in transmission lines for connection with present system, power substation and switching station facilities. Financing is being arranged by parent company.

LAKE CHARLES, LA.—Wackman Welded Ware Co., 2412 South Seventh Street, St. Louis, Mo., plans installation of motors and controls, electric welders, conveyors, electric hoists and other equipment in new branch plant in Goosport area, Lake Charles, where large tract of land has been acquired. It will consist of three main one-story units. A power house will be built. Cost reported close to $175,000. Work is scheduled to begin in September. New plant will specialize in steel barrels, drums and allied products.

MADISON, NEB.—Madison County Public Power District, Madison, has plans maturing for extensions in primary and secondary lines in parts of Madison County, for expansion in rural electric system, totaling close to 275 miles, with power substations and service facilities. Cost estimated about $300,000. State Railway Commission has granted permission and work will be carried out early in fall.

•

Kuhlman Gets Contract

Assistant Secretary of War Louis Johnson has recently reported the award of a contract to the Kuhlman Electric Co., Bay City, Mich., for electric arc furnaces. The contract amounted to $25,471.

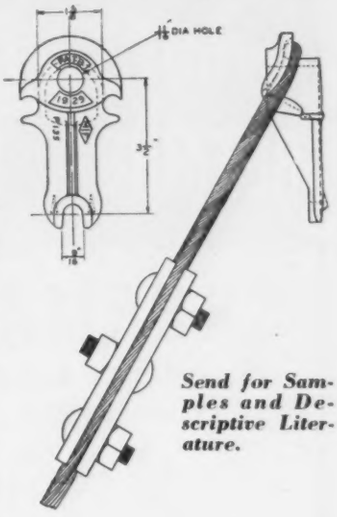
650,000 Installations Can't Be Wrong

The supplement with Electrical World issue of May 6, 1939, lists 145 Largest Generating and Distributing Systems in the U. S. 48 of these representative Companies and many other smaller properties regularly use M. I. F. Through-bolt Guy Hooks on exclusive or preferred specification basis. Investigation pays.

Guy Hooks— Three principal types in addition to the P134 Crossarm Guy Hook. P135 rated at 13,000 lbs. on ⅝" through-bolt is widely used for rural electrification. P133 rated at 20,000 lbs. on ¾" through-bolt. P132 rated at 40,000 lbs. on 1" through-bolt. Make up guy loops on the ground and save time of the whole gang. Prices as low as 15c each in quantity.

Eye Nuts and Anchor Rods— Thimbleless Eye Nuts for ⅝" bolt as low as 12c each in quantity. Larger sizes for ¾" and 1" bolts. Double Eye Nuts and various types of Bolt Eyes also available. Also furnished assembled and galvanized as unit on special steel rods of any desired length, rated at 80,000 lbs. per sq. in. at correspondingly attractive prices. These Eyes, used with standard stocks of through-bolts, round out simple specifications for pole-to-pole guys, etc., other than anchor type served by the Guy Hooks.

Curved Washers— Full line of Curved Ribbed Malleable Washers using the metal to better advantage than plate washers of uniform thickness, minimizing the pole-splitting stresses of through-bolt guying of any type, and strictly competitive as to price.



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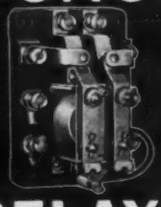

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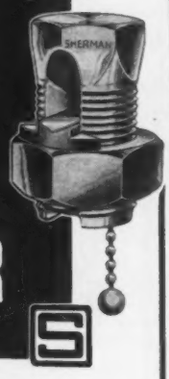

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Large machine threaded bodies and nuts—no sharp edges to damage wires or gloves—good thread fit, finger free but not sloppy—non-collapsing spacers—special high strength bronze alloy—hexagon heads of full and ample size—large or small head—nut retainers on small sizes if requested. Send for Bulletin No. 22.

Sold thru jobbers

WITHOUT NUT RETAINER

Capacitors Release Hydro and Raise Voltage

[*Continued from page 41*]

factor correction, G.E. individual unit distribution type Pyranol-filled static capacitors offered the best and at the same time the most economical and complete solution to the initial problem. But in addition to the purchased power improvement, capacitors would aid in correcting the other situations of low power factor on transmission and distribution lines, with resultant release of transmission, distribution and substation capacities for pay load duty. Accordingly capacitors were installed on distribution circuits out of each substation during the winter of 1937–38.

The Installation

The sytem now has 1,550 kva. of individual unit distribution type (class ID) capacitors in service. The number, sizes and ratings of the units are as follows:

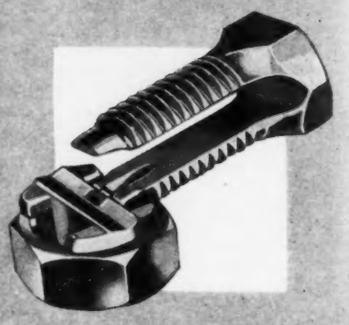
89–15 kva., 2,300 volt
2–10 kva., 2,300 volt
13–15 kva., 6,900 volt

As far as practicable the capacitors are installed individually on poles with 10-kva. or larger transformers. The capacitors are fused through the existing transformer cutouts. No changes in fuse ratings were made, since the 6.5 amp. current input to the capacitor is at approximately zero power factor leading, while the transformer load current, being lagging, normally limits the resultant current through the fuse to a value well under its rating. By utilizing existing transformer installation for capacitor locations, lightning protection does double duty at less over-all cost.

For Easy Inspection

In a few cases where it was desired to locate capacitors near the ends of rural lines carrying only small transformers (under 10 kva.), or the internally fused, self-protected type, the capacitors are likewise mounted on transformer poles in order to obtain the lightning protection afforded, and for additional facility of inspection. Such installations differ from the others only in having a separate set of cutouts for the capacitor. A number of three-phase, 45-kva. capacitor installations are made on power banks of 30 to 75-kva. capacity, using the same method as for single-phase locations.

Saves Time
Saves Material
Lasts Longer



The Blackburn Connector is easier to install. There's no loose nut to hold—no loose parts to drop—a real saving in time and material. It's made of Duronze, actually stronger than steel and more non-corrosive than pure copper. It's truly a life-time connector.

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Main and Clinton Sts. ST. LOUIS, MO.

ARE THE FINAL PROOF

You can use Everstick Anchors with complete confidence in their holding power—safety and long life. Made of Malleable Iron, built to stand the toughest guying service—known and recommended by leading engineers everywhere.

EVERSTICK ANCHORS...

★ EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

Modern Lighting Enhances Church Architecture

[*Continued from page 55*]

the four chancel pilasters creates a sort of reminiscent mood which relieves the otherwise monotonous expanse of white, and finally, a single spotlight concealed near the top of the arch accentuates the figure in the niche above the altar.

The decorative design of this altar is particularly effective when lighted in a manner to permit luminous shadows to bring out the raised portions of the pattern. If not so lighted the altar appears quite flat and lifeless. It was considered quite essential that a "third-dimensional" effect be introduced to bring the altar into relief against its background of white.

Both of these desired effects were accomplished by the use of a "modeling effect." This was created by so-called unbalanced cross lighting; that is, by using stronger light sources on one side of the arch single transparent shadows became ultimately present which enhance the ornamentation of the altar and cause the altar to be visibly separated from its background. Thus the center of the altar becomes the principal highlight, producing without effort the correct focal point so necessary in chancel lighting.

Flush Fixtures

Unusual care was required in selecting the lighting system of the nave. This involved provision of adequate light without glare, a major objective being enhancing the beauty of the interior. The equipment used is the flush type of fixture, each fixture having four 12-in. x 12-in. control lenses. These fixtures are placed one on each side of and below the apex of the arched ceiling, the beams of light being directed downward and across the floor area. The units are hinged at the back to permit cleaning and relamping from above the ceiling. Single-lens flush units are placed in the ceiling of the side arches to illuminate the outer aisles. In addition, concealed "feather edge" spotlights are used to emphasize the side altars located in the nave at each side of the chancel. All of the lighting equipment tabulated was manufactured by the Litecontrol Corporation, Boston, Mass., using Holophane "controlens" where indicated.

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POWER CABLE
Paper Insulated
Varnished Cambric Insulated

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ENGINEER! SAVE THAT POLE!

Since 1936, Virginia Electric Power Co. has applied Osmose Groundline Treatment to extend their poles' service life.

Apply Osmoplastic Groundline Treatment and Extend Its Service Life 7 to 10 Years!

WHY let groundline decay shorten the life span of your poles? Apply Osmoplastic Groundline Treatment *now* and positively prevent further groundline decay. Costs only $1 to $2 per pole (including labor). Application as simple as A-B-C. Used and endorsed by more than 50 leading utilities. Write for complete data.

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Another
"ANVIL BRAND" BLOCK
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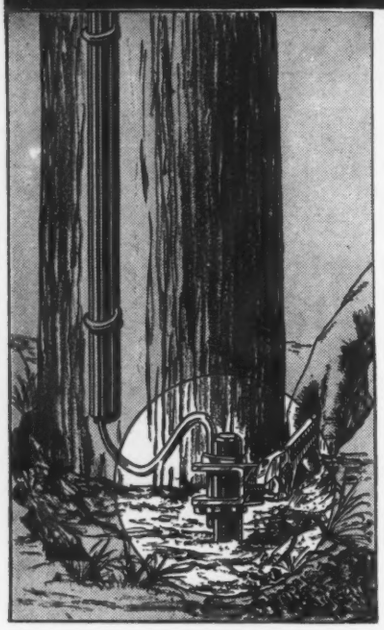

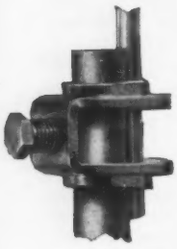

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OVER 25 YEARS SERVICE TO THE UTILITIES
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War Power Politics

[*Continued from page* 58]

news which would be water on their wheel. Never mentioning, of course, that non-essential industries (from a war standpoint only, of course) will naturally boom along with the war babies during neutrality, as the war baby payrolls expand and provide buying power.

Fortunately for the industry, there is a very different disposition in Congress toward the Administration's policy as to the utility industry than there was two years ago. Significant developments include the failure of Capitol Hill to become interested in the 7-TVAs and the vigorous cleaning to which the House subjected the TVA hundred - million - dollar - bond bill. The drift is distinctly against the government ownership crowd, at present. Full information as to the real situation will prevent war hysteria from stampeding an already suspicious Congress into yielding to this particular "war power."

•

Radio-Phonograph Set Feature Sales Campaign

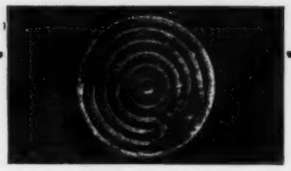
With the slogan "The Greatest Show for Your Money," a sales campaign, featuring a specially priced table model radio-phonograph combination, has been announced by E. F. Jeffe, vice-president of Consolidated Edison Co. of New York. The set will be priced at $23 cash for the a.c. model, with a total of $24.50 for deferred payments of $2.45 a month for ten months, $26.50 cash price for the d.c. model, with a total of $28 for deferred payments.

General Electric, manufacturer of the sets, will state at the end of the sales period—September 1 to December 15—this model will be placed in its regular line at $59.95 cash for the a.c. and $64.95 for the d.c. model. Consolidated Edison has underwritten the manufacture of 50,000 sets to start off the campaign.

•

Will Duplicate Prizes

When cash prizes are handed out by the Modern Kitchen Bureau for the best dealer windows featuring electric water heaters, from September 1 to October 31, any dealer whose winning window features Hotpoint water heaters exclusively will receive a duplicate cash award from the Edison General Electric Appliance Co., Inc., according to A. H. Jaeger, manager of the water heater division.



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THERMOLAIN

Heat - resistant, refractory porcelain for electrical heating devices where sudden changes in temprature occur. Used extensively in electric ranges, irons, air heaters, radiants, rheostats and immersion heaters.

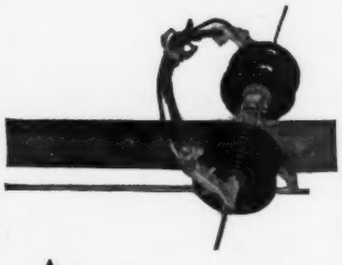
MAKERS OF ELECTRICAL PORCELAIN SINCE 1899: LAVOLAIN, VITROLAIN, THERMOLAIN, NU-BLAC, COMMERCIAL WHITE ★ AND STAR METER SEAL

The STAR
PORCELAIN COMPANY

51 Muirhead Ave. Trenton, N. J.

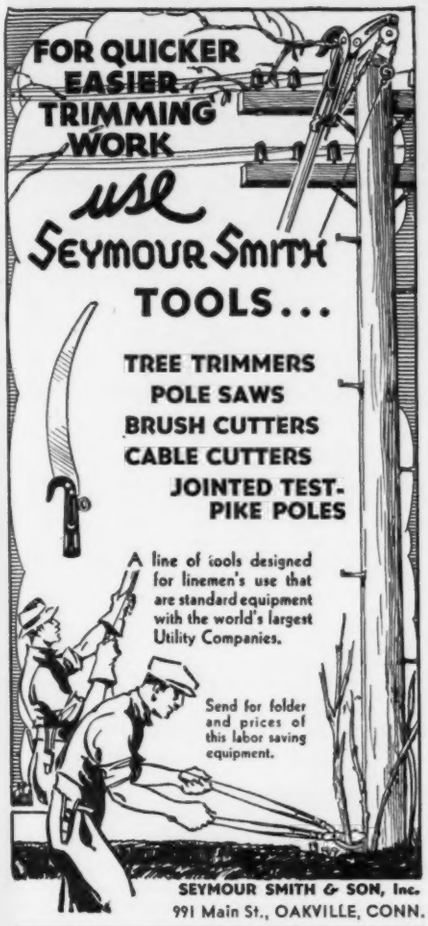
K-P-F

Pole Top
High Tension
Switches



A K-P-F switch merely consists of two deadends with a rigid jumper containing a contact so arranged that it can be opened and closed. This constitutes the NECESSARY and SUFFICIENT parts of a disconnecting switch.

K-P-F ELECTRIC CO.
855 Howard St. San Francisco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A line of tools designed for linemen's use that are standard equipment with the world's largest Utility Companies.
Send for folder and prices of this labor saving equipment.
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are made of high grade cotton fabric treated with special varnishes from Acme's own varnish plant. They have great tensile strength and flexibility and may be stretched snugly into all corners and crevices, making a mechanically smooth and electrically efficient seal. Offered in bias or straight tapes or rolls up to 36" wide, yellow or black. Samples if requested. Address *The Acme Wire Co., New Haven, Conn.*

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COILS — CAPACITORS

BOOK REVIEWS

High-Frequency Alternating Currents

By Knox McIlwain and J. G. Brainard. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. 530 pages, illustrated. Price, $6.

Second edition retains the fundamental mathematical approach to composite electromechanical circuits involving alternating currents at frequencies from those in the voice range to those of radio. One of the significant additions is the introduction of the Lagrangian equations so as to make more explicit the handling of electromechanical combinations such as arise in telephone instruments. Apparatus and communication circuits of commercial origin are dealt with sparingly, the intent manifestly being to cultivate an analytical appreciation of basic phenomena and performances of coupled circuits, thermionic tubes, amplification, detection and generation of the high-frequency supplies. Wave filters, lines, waves, reflection and refraction are likewise subjected to analytical scrutiny so as to set up the characteristic expressions for their normal and abnormal behavior. The book is a text frame for senior and first-year graduate students at the University of Pennsylvania. There are many practical charts and tabulations of characteristics.

•

Practical Electrical Illumination and Signal-Wiring Methods

By Terrell Croft, Consulting Electrical Engineer. Revised by George H. Hall. Published by McGraw-Hill Book Co., 330 West 42d Street, New York, N. Y. 351 pages, illustrated. Price, $3.

Illumination technology and practice are here made as simple as they can be and still be quantitative in approach to typical installations of lighting. Half the pages are devoted to the units of measurement, descriptive matter about types of lamps and reflectors and the procedure in designing installations. Half the remainder treats indoor and outdoor lighting requirements. Thus the final fourth of the book deals with the quite distinct and largely unrelated matter of signal-wiring systems and methods for elevators, annunciators, intercommunicating systems, etc., with many useful schematic layouts. Industrial electrical men will therefore be most likely to find the book helpful in tasks set for them in lighting and signaling.

•

1938 A.S.T.M. Proceedings

Published by American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa. 2,080 pages. Price, $5.50 each for Part I and II.

The 1938 Proceedings are published in two parts, Part I comprising committee reports (with appended papers) and new and revised A.S.T.M. tentative standards. Part II gives technical papers, including the Marburg lecture. Ten of the 50 reports in Part I involve ferrous metals, magnetic properties, ferro-alloys, iron-chromium-nickel and related alloys, fatigue of metals and effect of temperature on the properties of metals. The latter has appended papers covering long-time creep tests of certain steels, effects of manufacturing variables on the creep resistances of steels, accept-

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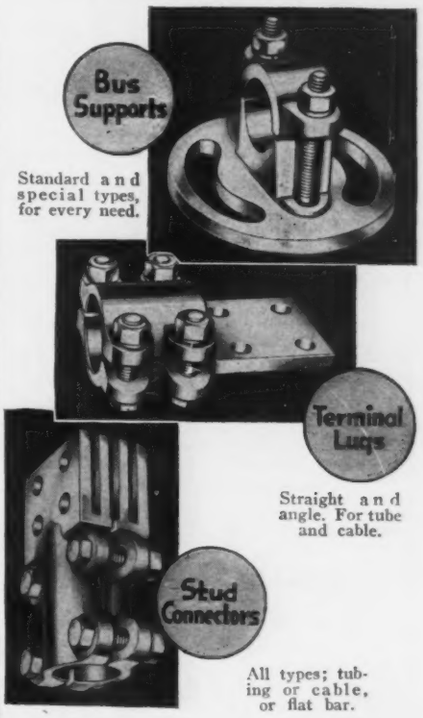

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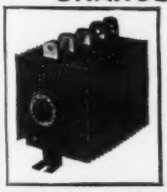

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Original Cost for Utility Accounting

By Samuel Cahan. Published by New York Public Service Commission. 40 pages.

This pamphlet reviews the struggle of the state commissions, led by New York State, to establish original cost as the basic property entry in utility accounting. It traces through the ICC, the FCC and the courts the steps by which the November 12, 1932, accounting ruling of the ICC stipulating reproduction cost entries for telephone companies was finally reversed by the FCC and sustained by the U. S. Supreme Court (December 7, 1936) so as to become a revolutionary shift to the original cost basis initially mentioned, but always vaguely defined, in the celebrated Smyth vs Ames case. Also records how continuing property records supplement original cost entries so as to sound the death-knell of appraisals and valuations.

•

Direct-Current Machinery

By H. S. Bull. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. 318 pp., illustrated. Price, $3.

This book is intended primarily for use as a text-book by electrical engineering students who are beginning a course in electrical machinery. Following the more conventional procedure of discussing electromagnetic relations, measuring instruments and the structural features of d.c. machinery, the author presents the shunt motor. The shunt motor is taken up early in the book. Series and compound motors are next considered, with motor starters and speed-control devices next in order. Following development of motor saturation curves the author treats generators, the

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correctives for armature reaction and commutation difficulties. In a chapter on special types of generators the arc-welding type is included. As a feature not often found in textbooks, the author includes a brief picture of some of the factors influencing rating and cost of machines.

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Electrical Engineering Experiments, Theory and Practice

By Henry R. Reed and George F. Corcoran. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 500 pages, illustrated. Price, $4.50.

A manual of instruction for laboratory exercises in electrical engineering courses, this book also presents some of the underlying theory along with the technique of conducting and reporting tests. This is accomplished in such manner that a companion textbook of theory is not indispensable. For this reason the book can well have value for utility and other commercial laboratories regularly encountering tests of circuits, rotating machines, transformers, instruments and a limited amount of electronic apparatus (particularly of the power field type). Generally speaking, the technique follows that of the large manufacturers' test floors and reflects conformity with established standards. Something over 160 different and independent tests are covered after a preliminary section dealing with choice of instruments and methods, errors and the functioning principles of instruments.

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Television, an Occupational Brief

Published by Western Personnel Service, Pasadena, Cal. 16 pages. Price, 50 cents.

Survey of the industry and the research agencies shows that when the technical, regulatory and financial bars to the expansion of television are overcome there will be a wide variety of positions available to competent engineers in building, operating and servicing the television stations and receivers. Generally they will have to superpose upon basic communication engineering the technique of acoustics, photography, wave propagation and all of the present radio, plus much of motion-picture engineering. Present manufacturers are listed. Government jobs are cited as another category of opportunity.

•

The Electric Power Industry

By John Bauer and Nathaniel Gold. Published by Harper & Brothers, 49 East 33d Street, New York. 347 pages. Price, $3.50.

"If outright public organization of electric power is to replace extensively present private organization with governmental control, consideration must be given to revision of law, treatment of existing properties, form and scope of organization and processes of conversion." This end result is the objective of the book and all the weight of argument and statistics is directed to justification of the movement. Phenomenal technical advances warrant much lower rates, management still is obsessed with a profit motive, system costs can be much lower, salaries are too high, profligacies of holding companies are millstones, rates are insufficiently promotional, discrimination is rampant, demand charges are largely unwarranted, financial structures have been ballooned, book values per customer are twice too high, present integrations are unsupportable, gas is subsidized electrically—these are the defects cited in justification of the reform wave.

Nor, in the authors' estimation, can state regulation succeed, because there is too much complacency toward companies and too little zeal in the public interest. Awakening of municipal responsibilities may afford some corrective, and this seems to them to offer more permanent promise than federal regulation and competition, although municipal arrangement admittedly has weaknesses which may well lead to intervention of the states into the program.

The utility industry should find here an unusually concise and lucid exposition of the school which would convert their properties into agencies of government. Biased, of course, and occasionally fallacious, but zealously militant and persuasive.

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Arc Welding in Design, Manufacture and Construction

By The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. 1408 pages, illustrated. Price, $1.50 postpaid in U. S. A.

The outstanding papers—109 in all—submitted in the recent $200,000 Award Program of the James F. Lincoln Arc Welding Foundation are now available in book form. With few exceptions, the papers are reproduced in their complete form, with designs, drawings, calculations, procedures and costs included. The book is arranged in ten sections: Automotive, aircraft, railroad, watercraft, structural, furniture and fixtures, commercial welding, containers, machinery and jigs and fixtures. Of particular interest to electric utility engineers should be the papers dealing with the welding of a line truck body, of hydraulic turbine scroll cases, spiral casing for a water turbine, a motor truck winch and pre-welded turbine blades. Welding engineers in other branches of industry should find the book a handy and voluminous reference book on present-day practice and technique in arc welding in its various phases.

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The American Way of Life

By George E. Sokolsky. Published by Farrar & Rinehart, New York. 180 pages. Price, $2.

Upholding the American system of promoting enhanced markets to support enterprise founded on free initiative, this book effectively blasts the idea that advertising expenditures make American goods cost more to the American people. Entrancingly Sokolsky passes in review the parade of ventures which started with the glint of an idea and became industries employing thousands of people and millions of savings to make ever cheaper, ever better goods to nourish a standard of living unsurpassed. It refutes the consumer-research literature and "guinea pig" books. Oranges, milk, automobiles, cereals, cosmetics, home appliances—whatever it is—the American worker can buy more for an hour's labor than anywhere else, all because their virtues and availabilities are publicized.

Utilities advertise their kilowatt-hour wares in the same way and here they will find dozens of arguments and proofs why their outlays for load stimulation can hardly create a tax that impedes the flow of energy into homes at ever lowering cost. That may be handy ammunition whenever the inescapable practice of paid public announcements may be assailed by the reformer.